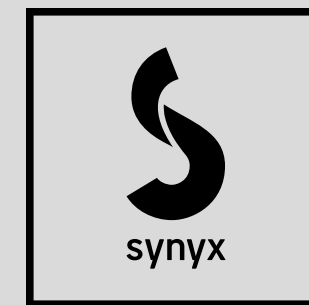


# MICRO-FRONTENDS IN REACT



**Denise Schäfer**  
(denise.schaefer@dm.de)



**Benjamin Seber**  
(@\_seebaer)



# RÜCKBLENDE

Was bisher  
geschah...

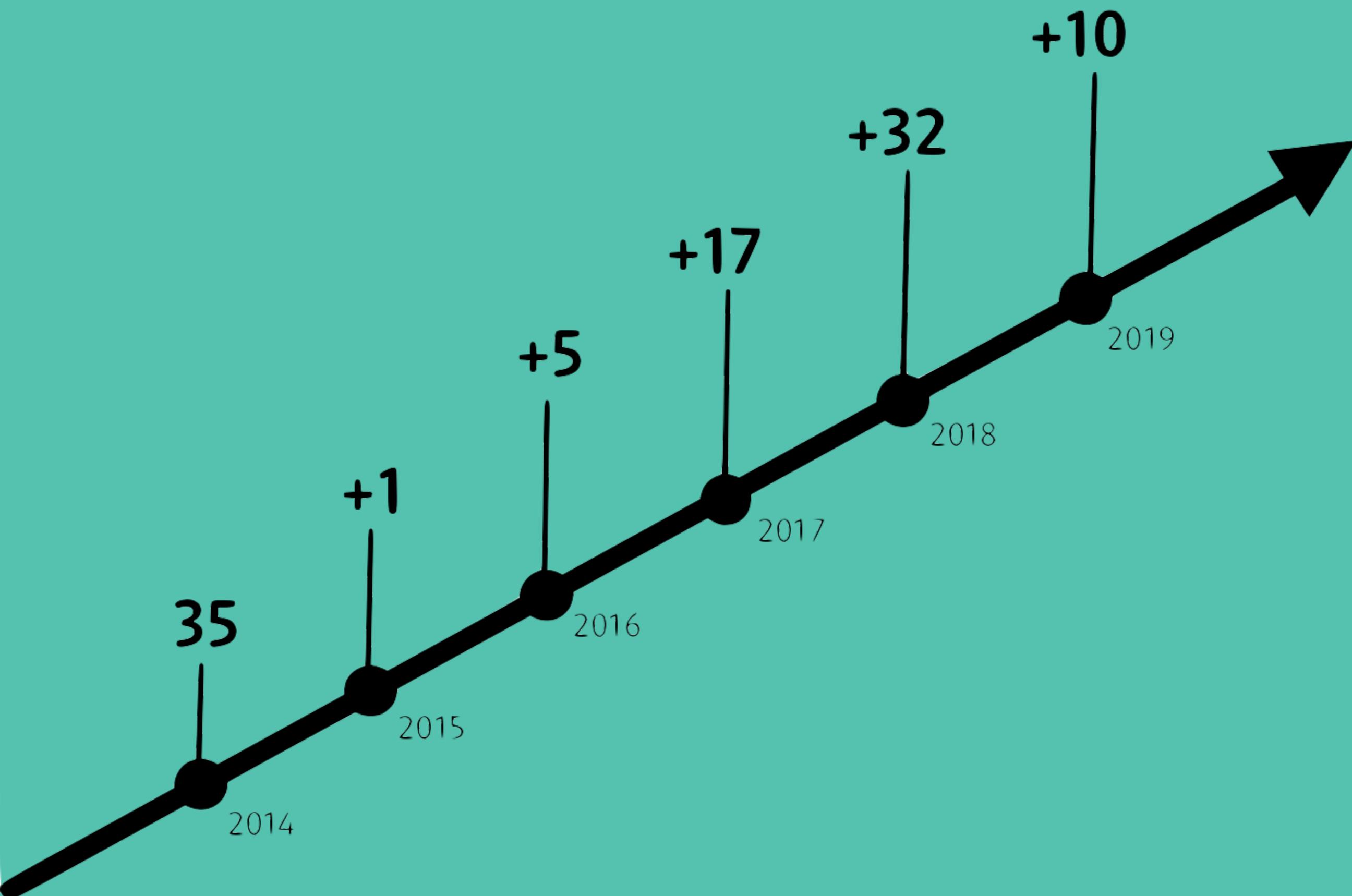




```
2013-05-15 - 18:46 0e66126f4f0b3cf30555005
2013-05-14 - 16:46 a6283da8901558b657cb5b20ed
2013-05-14 - 13:17 36c12ee9120e0dcef5c43e05d0b1
2013-05-13 - 14:28 906b6be40bc01f17fcda2673f0c93c
ay 2013-05-13 - 14:23 c098905fdb1c17fd8dce9593fc74a134
May 2013-05-13 - 06:37 7f1bddbe57f5282a9239a0baacbae7dc7b
n May 2013-05-13 - 06:36 0e0275dd95646c9fcb1321bf93648e82494
ri May 2013-05-10 - 14:38 8964f525b9726a68428e596e55b01f081882
ri May 2013-05-10 - 14:24 074c37b8d5d5abfb364d92725a344f87e2b45
Fri May 2013-05-10 - 12:40 f66bcbc54c46d84f6665cd276cd8e2fb9a28c1
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 44d132c640830dbdb0d4d94649ff0156f941064
* Tue May 2013-05-07 - 18:37 82ac7fc59309fccffd87379f0e2cdbacbb7d02e8
* Mon May 2013-05-06 - 16:37 3b2dfae8f7c99c6b439f2b87fcaa11c885e518a
* 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
hu May 2013-05-02 - 17:42 027f4f4a213b7b0e3b83dca239d5c637108b
u May 2013-05-02 - 14:27 d0241edc44460795ef7b1d66751f3441503
Apr 2013-04-29 - 16:19 3215bc364646d79f36def6342a3eee3a6c
pr 2013-04-29 - 16:18 e58c0d746dd86130d1767fe14fcd5a36
2013-04-29 - 15:53 8d6bfe2415c32d9c338bad543535af6
2013-04-29 - 15:00 23079093b029198af87944df37d38
3-04-29 - 14:57 daciaa810a76a1f237292a0443c
4-29 - 13:05 56f83a9a9bddae49c33341b
- 10:05 b55583fa3f00f98f3590
21 c18407604b50b28
```

# CoreMedia Git Historie

- 2013



Anstieg der  
**Contributor**

# CoreMedia Git Historie

- 2016



```

d Mar 2016-03-09 - 14:10 8b
Tue Mar 2016-03-08 - 17:17 dd25
Mon Mar 2016-03-07 - 15:48 3df3504089e
Mon Mar 2016-03-07 - 09:25 914f2148175cb
Mon Mar 2016-03-07 - 09:01 e5d4e4ac7db9dae
Fri Mar 2016-03-04 - 16:59 ed6cb2e9aa46ff6
Fri Mar 2016-03-04 - 16:39 6a1f69a62cddb89
Fri Mar 2016-03-04 - 15:51 182d1bd2f98fcfc7665
Fri Mar 2016-03-04 - 15:51 fb3164a570d91194ca7a
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 9812c58a0530e1e911
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 5abb
Thu May 2016-05-19 - 16

```

Wir brauchen  
**mehr Features!**

Was war denn  
Anfang 2016?

Einiges! Wo soll  
ich anfangen?  
Aaalso...

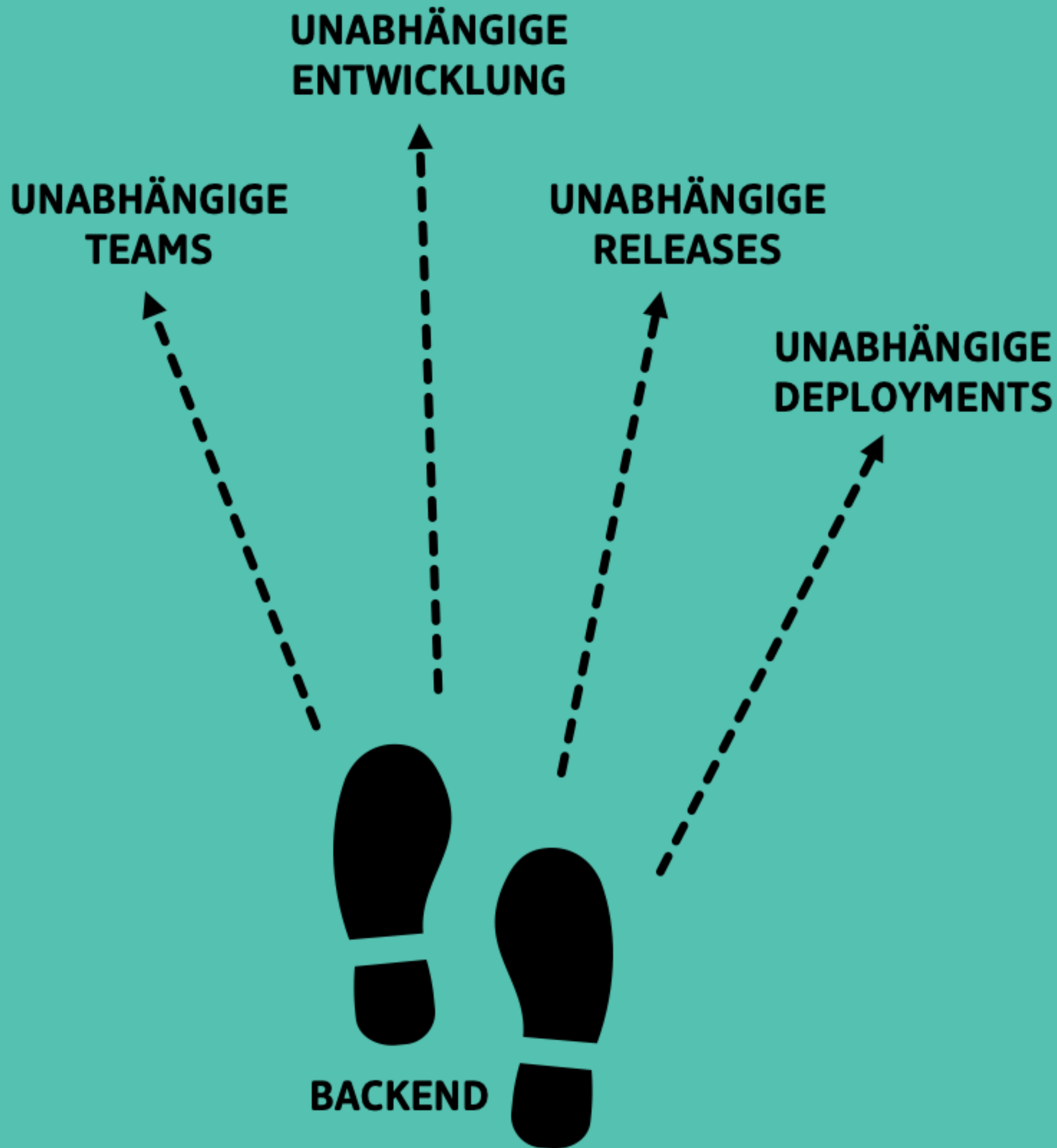






# Micro-Services im Backend





# Unabhängigkeit nur im **Backend**



# Skalierung im Backend

BACKEND



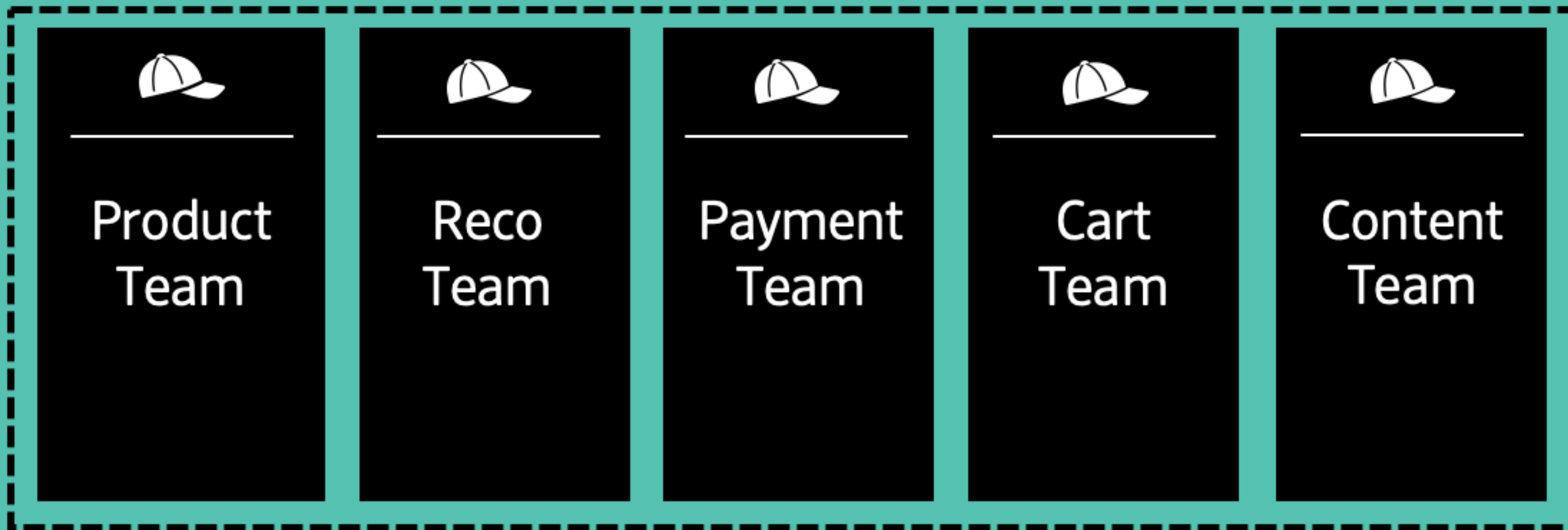
FRONTEND



## Frontend-Team



## Backend-Teams



Hey, wie sieht's aus mit der Variantenkollektion?  
21.01.2016 - 13:37

Will die endlich produktiv haben.  
21.01.2016 - 13:38

Meinst du ihr schafft das bis Ende der Woche?  
21.01.2016 - 13:38

also ich habve eine gute und eine schlechte nachricht  
für dich  
02.01.2016 - 13:42

Ich will nur Gute Nachrichten hören!  
21.01.2016 - 13:43

ja, klar...  
also die gute nachricht ist, wir sind fertig  
21.01.2016 - 13:45

die scglecte ist  
21.01.2016 - 13:45

wir müssen noch warten bis das frontend für den  
webshop steht...  
21.01.2016 - 13:46

ungelesene Nachrichten

Bitte was?  
21.01.2016 - 13:46

## Auswirkung für den Product Owner



# WANTED

## CROSS-FUNKTIONALE TEAMS



Team  
Product



Team  
Reco



Team  
Content



Team  
Checkout



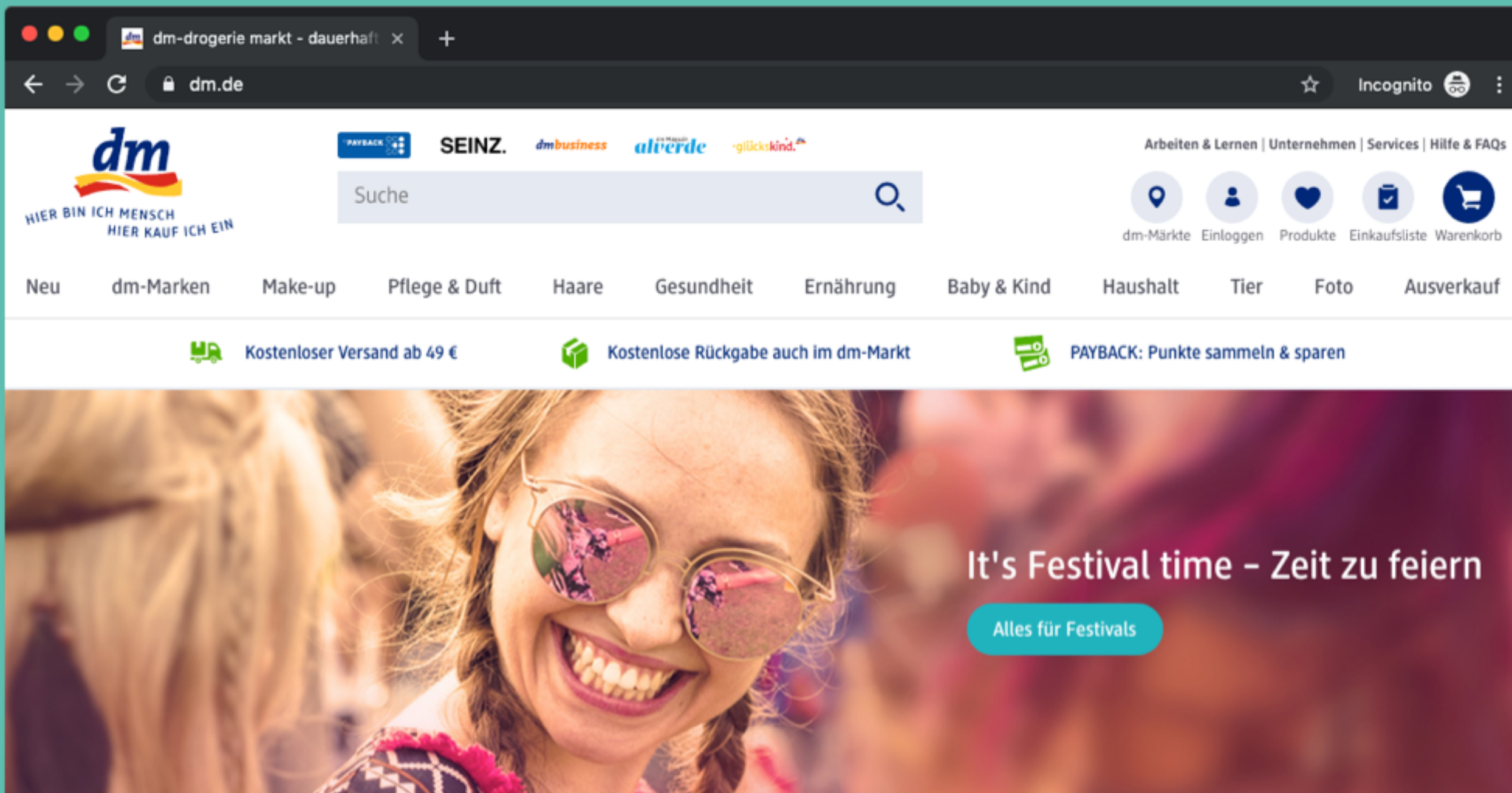
Team  
dm-Konto

## FRONT- & BACK-END





Versuche zur  
**Eigenständigkeit**



**content-view-service**



*BABEL*



webpack



ESLint

**product-view-service**



*BABEL*



webpack



ESLint

**content-search-service**



*BABEL*



webpack



ESLint



`GitOverride:` endlich hab ich die  
selectbox fertig

`GitOverride:` 🌟( 🌟 )🌟

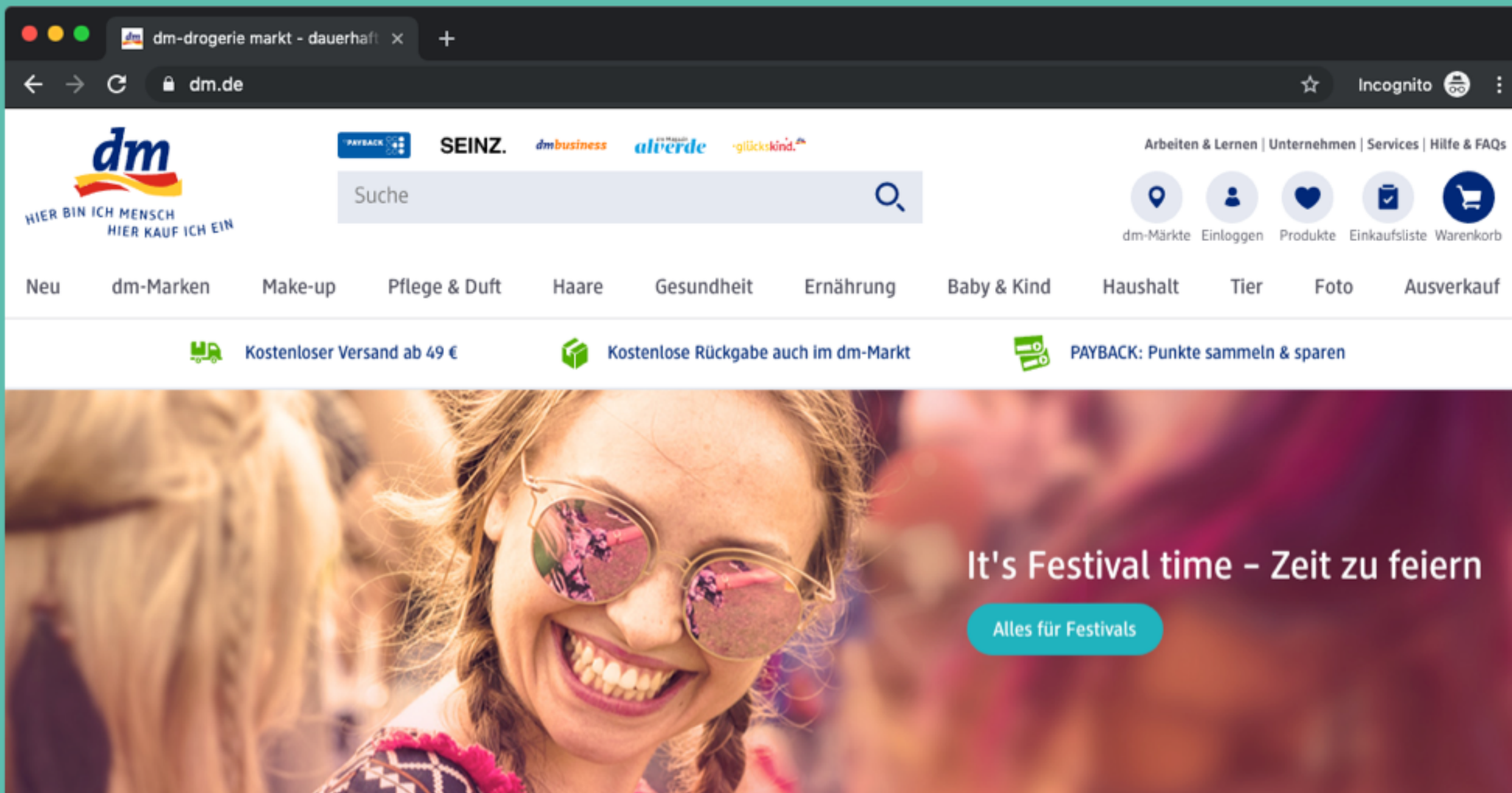
`GitOverride:` ganz schön viele extra  
features wieder...

`GitOverride:` nativ und gut is...

`Front_Ente:` was habt ihr denn  
gebraucht? wir hätten da  
was 🤪

`GitOverride:` special styling  
unterschiedlich auf  
desktop und mobile  
versteht sich

# React Components



**content-view-service**



**BABEL**



**webpack**



**ESLint**

**product-view-service**



**BABEL**



**webpack**



**ESLint**

**content-search-service**



**BABEL**

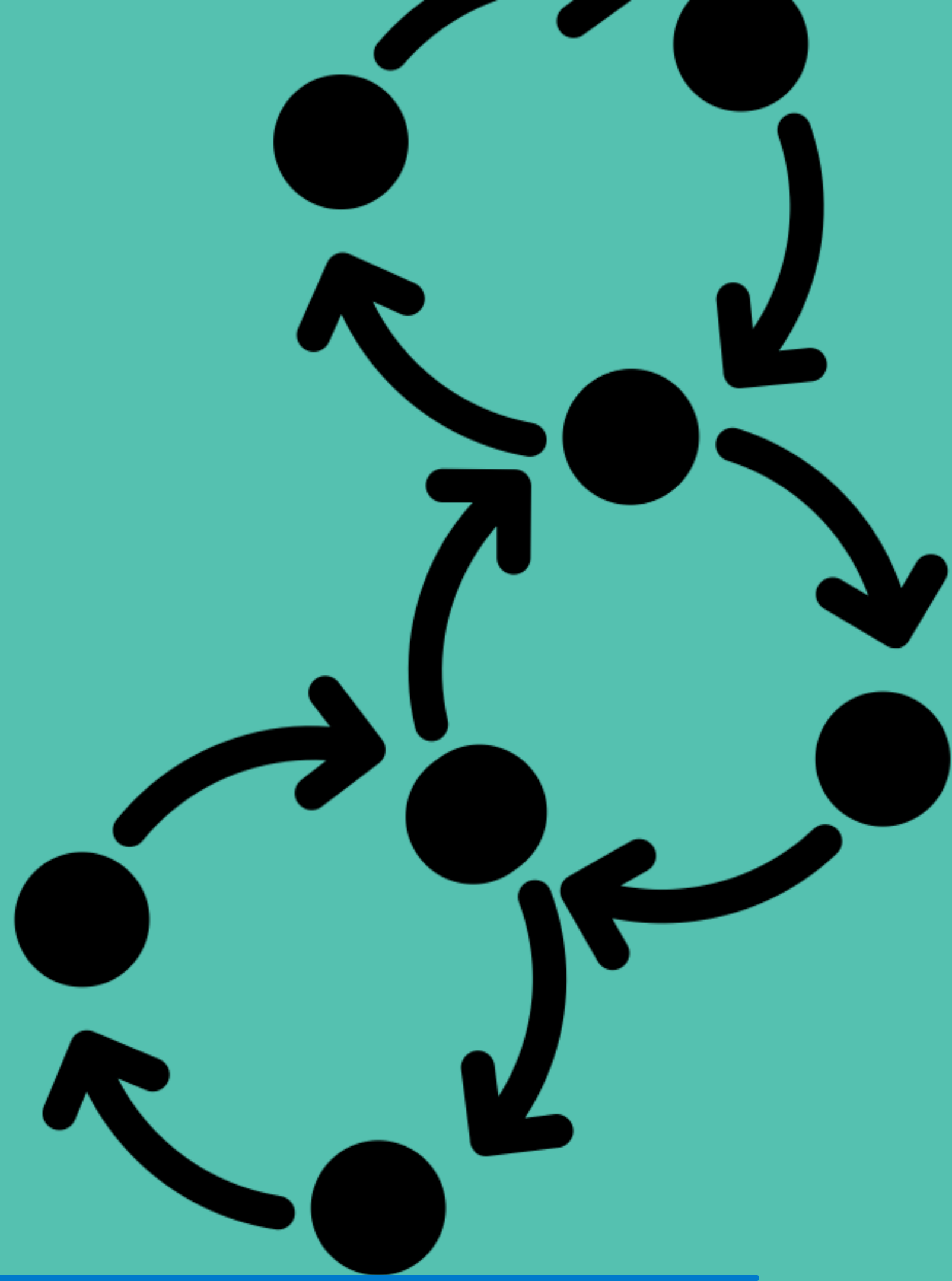


**webpack**



**ESLint**

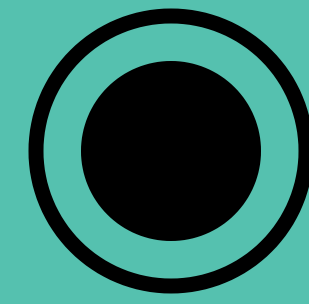
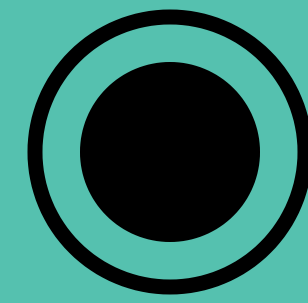
**react-components**



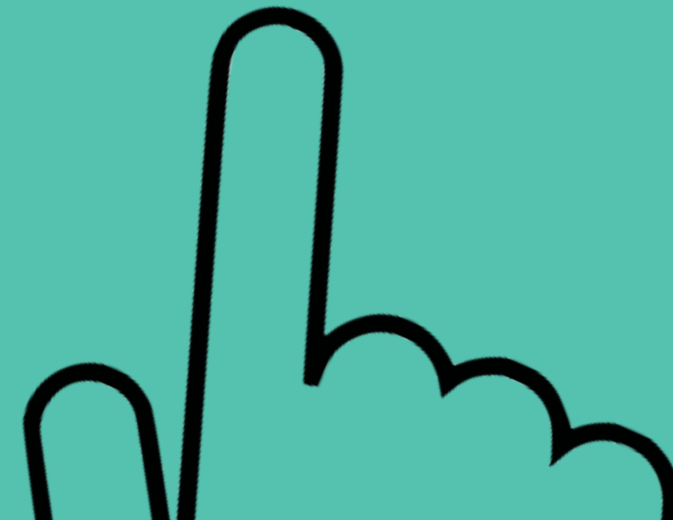
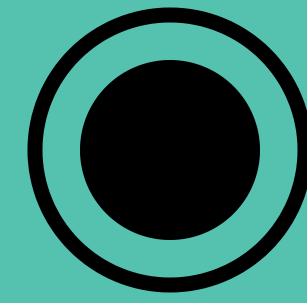
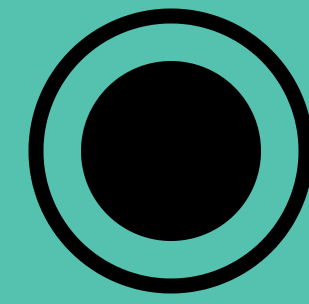
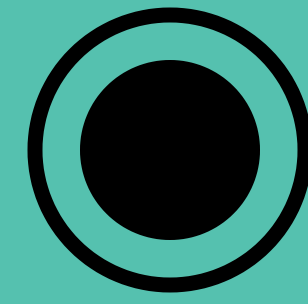
Aber erstes Zwischenergebnis:

# Abhängigkeitszyklen

= verteilter Monolith



**3 2 1 PUSH!**



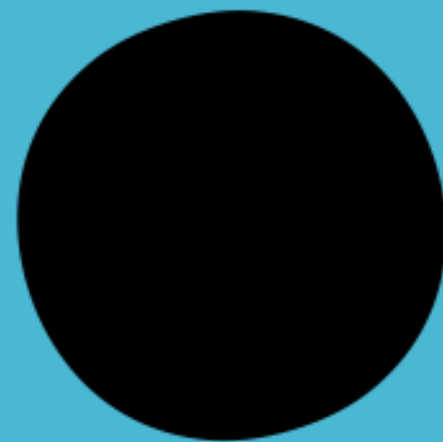


# DAS RÄTSEL

---



**WIE TEILEN WIR  
DAS FRONTEND AUF?**



Suche

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 39 € Kostenlose Rückgabe PAYBACK: Punkte sammeln & sparen

MARKE von dm

Balea MEN Duschgel arctic fresh, 300 ml

5.0 (2)

Mehr Informationen zum Produkt

0<sup>95</sup> €

In den Warenkorb

Auf die Einkaufsliste

300 ml (3,17 € je 1 l) Einzelpreis inkl. MwSt. zzgl. Versandkosten Lieferbar

In welchen Filialen ist dieses Produkt verfügbar

Bitte PLZ / Ort angeben

dm-Dauerpreis nicht erhöht seit 06.03.2015

PAYBACK Für jeden Euro Warenwert erhalten Sie 1 PAYBACK Punkt

Produktbeschreibung

Balea MEN

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

# Schauplatz Detailseite

# Schauplatz Suche

- Domain Suche (Rahmen) 1
- Domain Produkt-Suche 2
- Domain Content-Suche 3

The screenshot shows the dm website search results for 'Balea'. The search bar at the top contains 'Balea' and is annotated with a '1'. Below the search bar, the navigation menu includes 'Neu', 'dm-Marken', 'Make-up', 'Pflege & Duft', 'Haare', 'Gesundheit', 'Ernährung', 'Baby & Kind', 'Haushalt', 'Tier', 'Foto', and 'Ausverkauf'. The search results are displayed in a grid format, with the first four products highlighted by annotations '2' and '3'. The products shown are:

- Balea Fuss Hornhaut Entferner Socken Feel Well (3,95 €)
- Balea Fusscreme UREA (1,25 €)
- Balea Duschöl (1,85 €)
- Balea erfrischendes Waschgel (0,95 €)

The left sidebar contains filters for 'Alle Sortimente' (Pflege & Duft, Haare, Baby & Kind), 'Beliebte Filter' (Marke von dm, Vegan, Ohne Silikone, Für Männer, Neu, Medizinische Pflege), and 'Marken' (Balea, COLORNIQUE, Balea Med, Balea MEN, Balea).



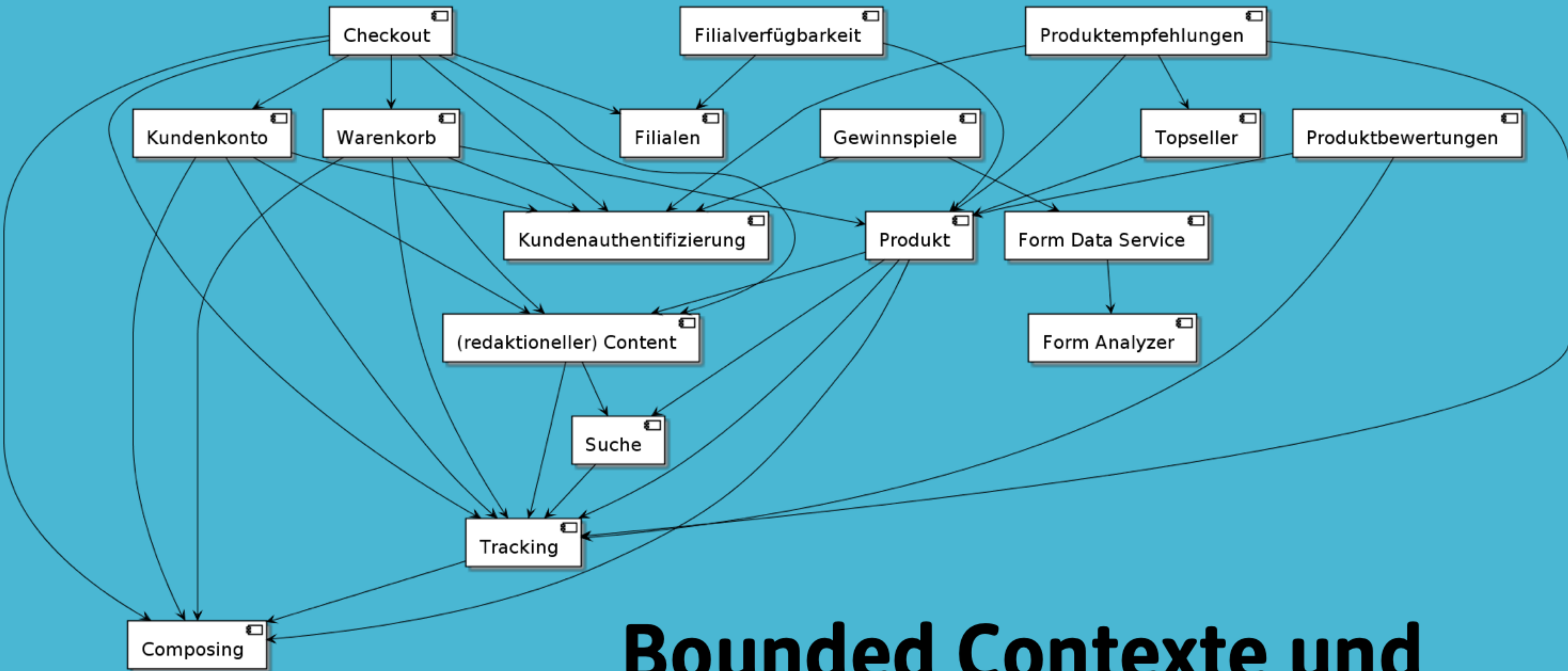
# Schauplatz Suche

The screenshot shows the dm website search results for 'Balea'. The search bar at the top contains 'Balea' and is marked with a '1'. Below the search bar, there are navigation links for 'Produkte (623)' and 'Beratung (206)', with the 'Beratung' link marked with a '3'. The main content area displays three search results: 'Balea Deo', 'Über Balea', and 'Balea Winter'. The 'Balea Deo' result includes a date '22.12.2017' and a 'Seite öffnen' link. The 'Über Balea' result includes a date '11.01.2016' and a 'Seite öffnen' link. The 'Balea Winter' result includes a date '25.10.2018' and a 'Seite öffnen' link. A '2' is placed over the search results area. On the left side, there is a 'Beitragstypen' section with a list of categories and their counts: Redaktionelles (93), Specials (79), Downloads (15), Produkt-Kategorien (9), dm-Marken (2), Beratung & Information (1), and Häufige Fragen (7).

Domain Suche (Rahmen) **1**

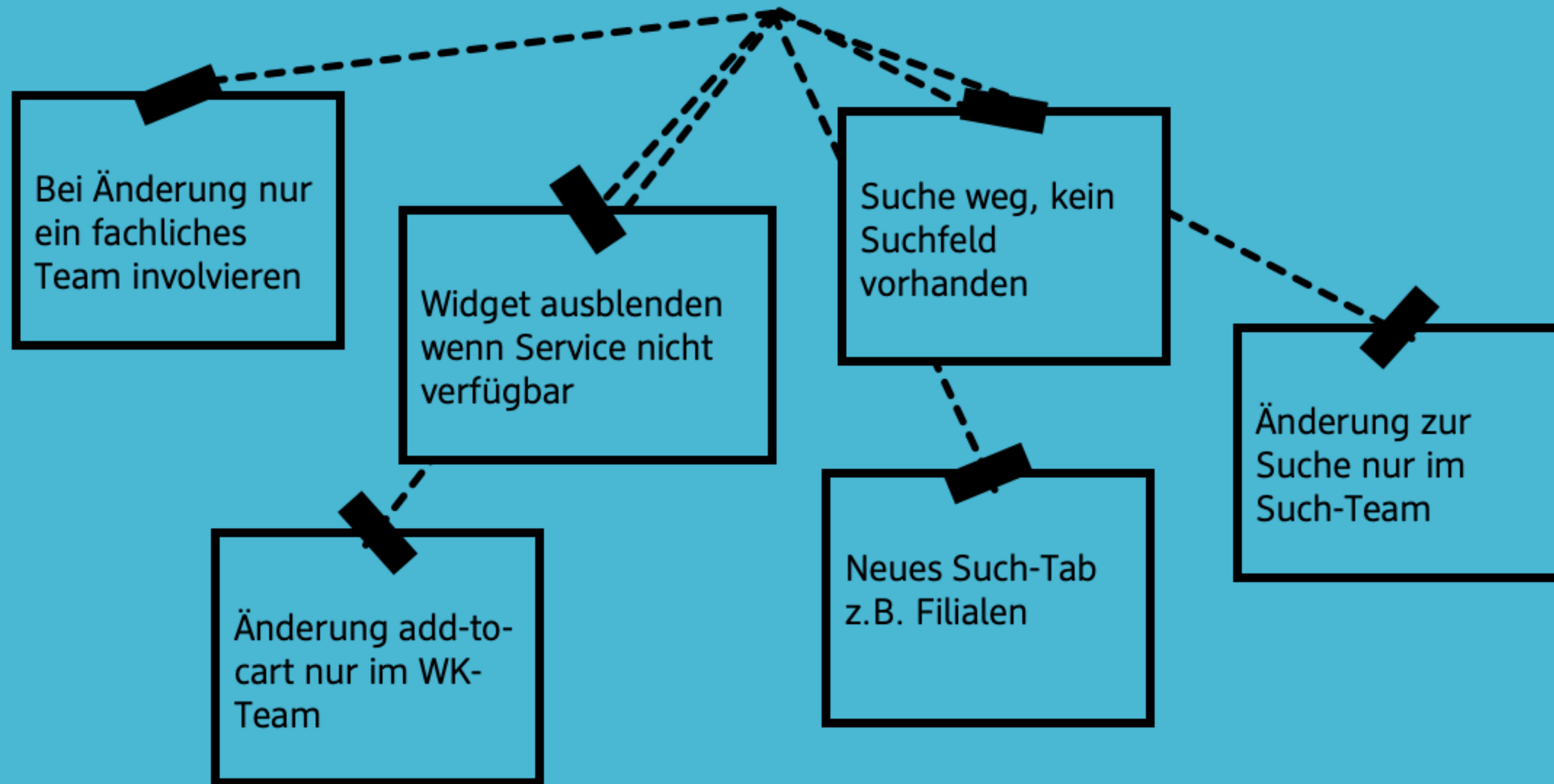
Domain Produkt-Suche **2**

Domain Content-Suche **3**

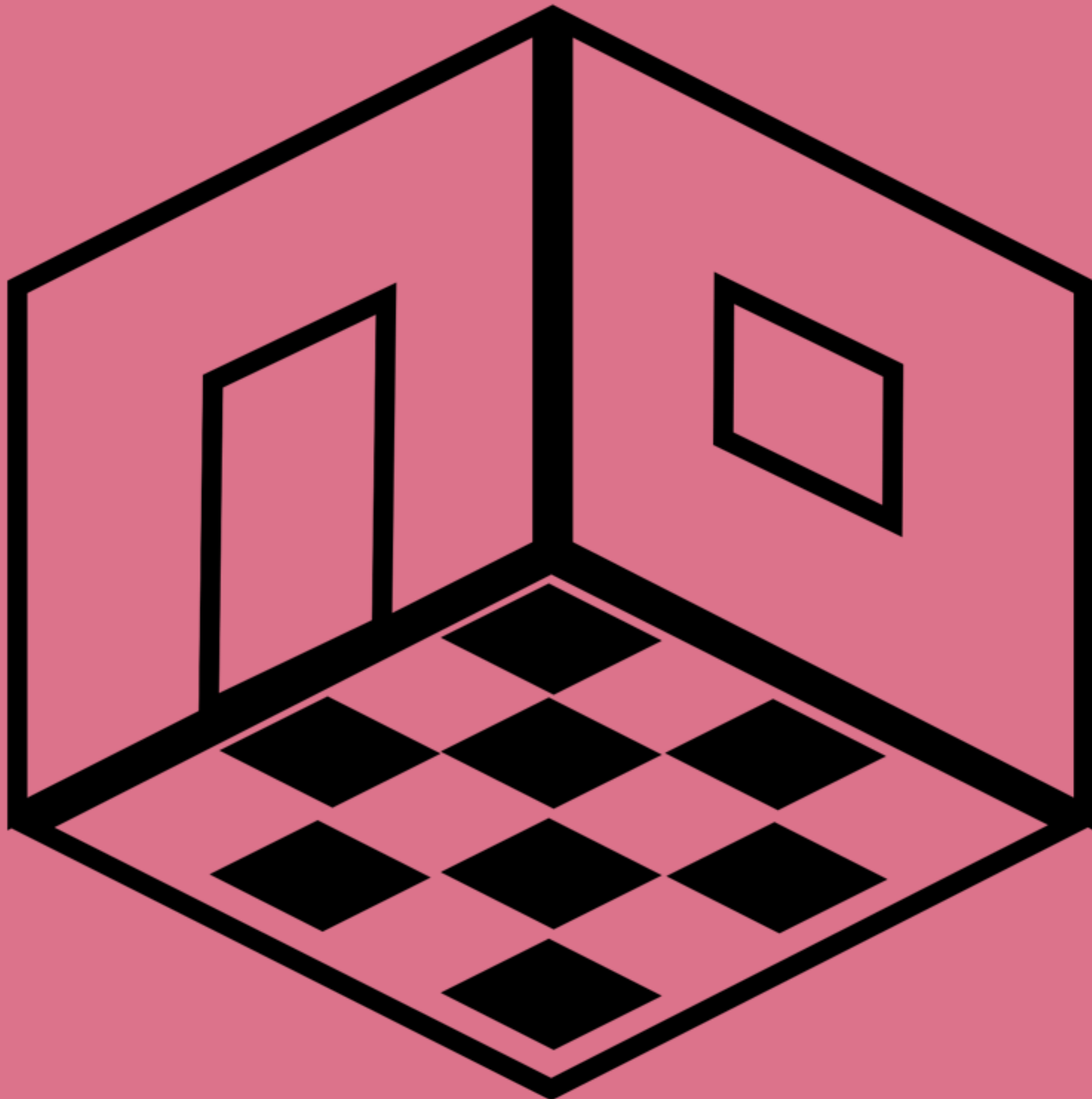


# Bounded Contexte und Abhängigkeiten bei dm.de

# 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>



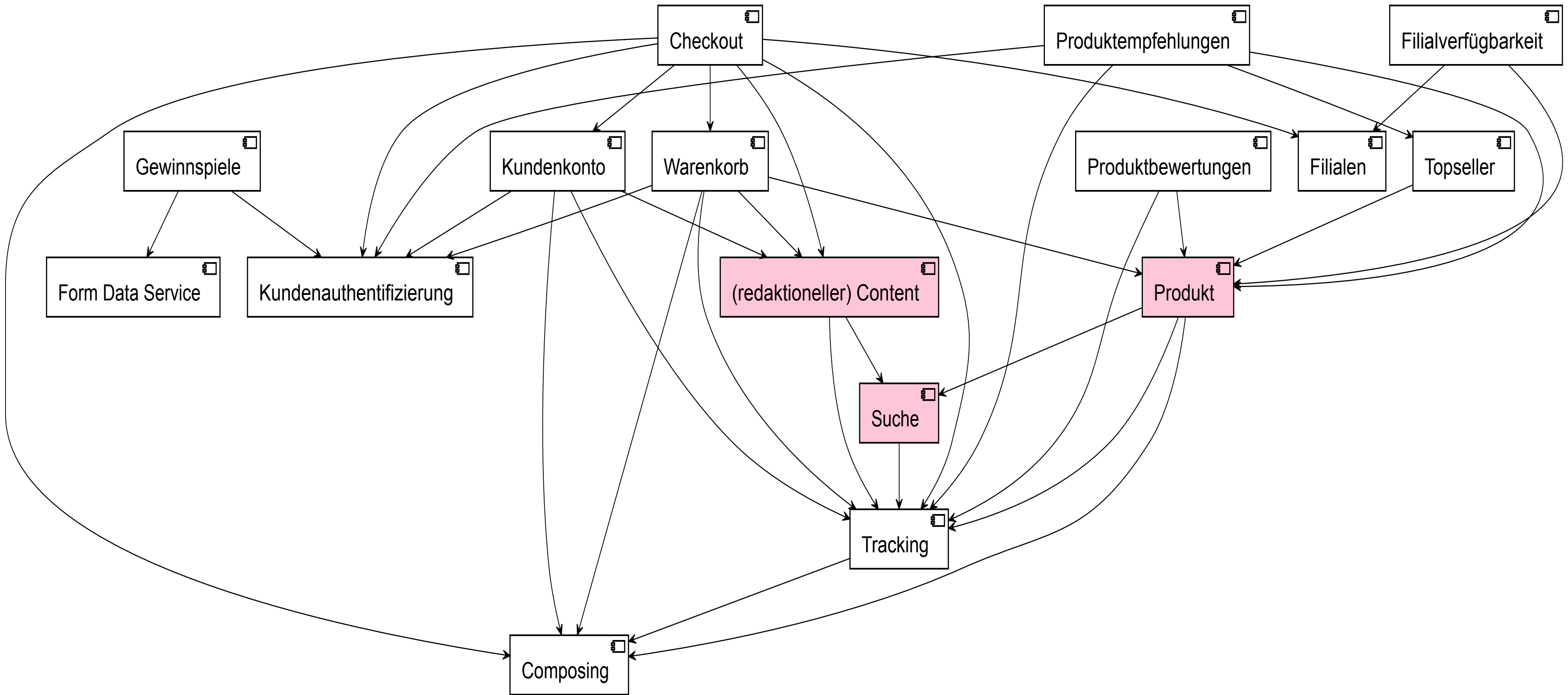
**< DEPENDENCY  
INVERSION />**

Allgemeine Module  
hängen nicht von  
speziellen Module  
ab.

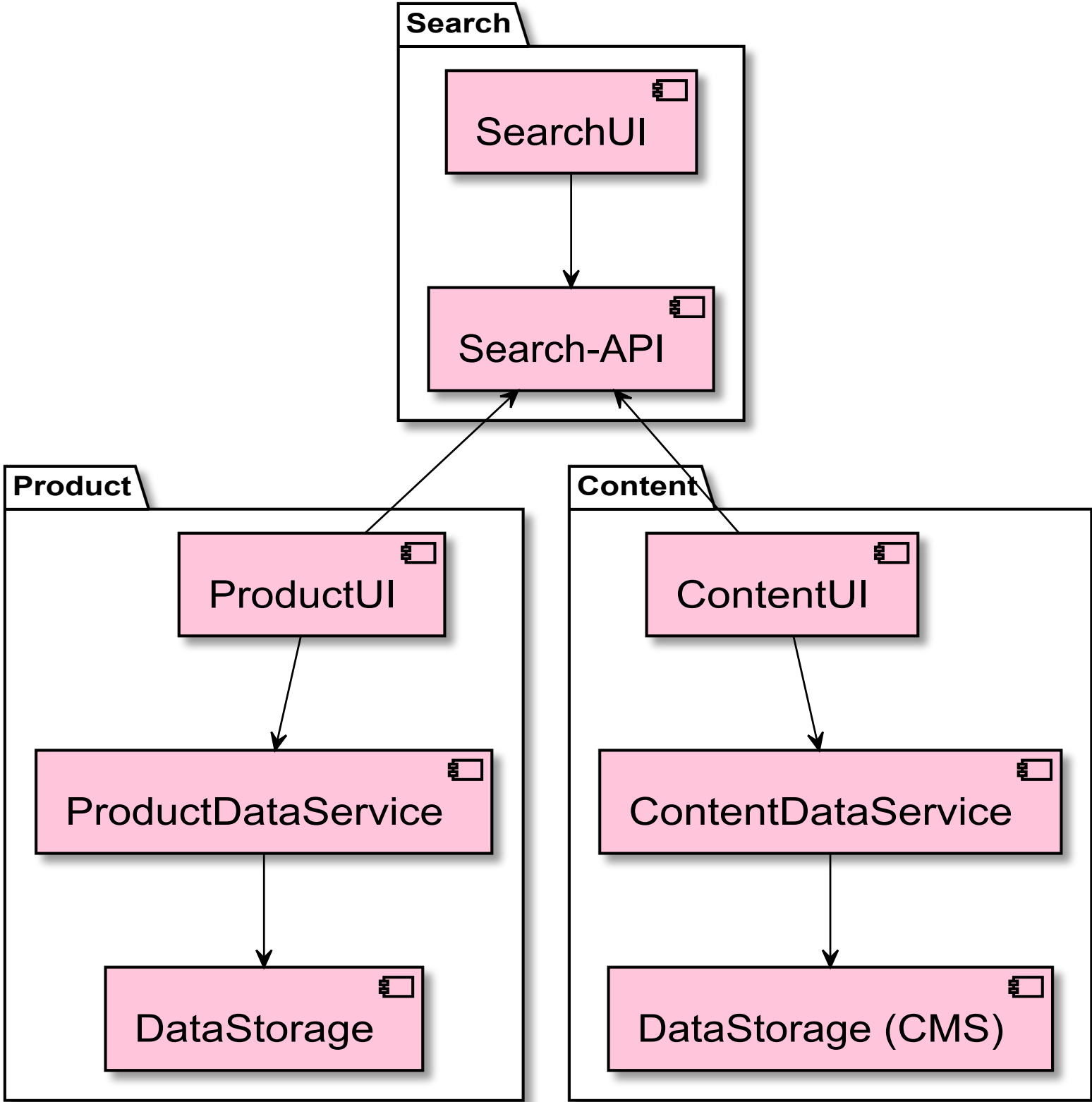
Spezielle Module  
hängen von  
allgemeinen  
Modulen ab.



# 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

**dm** balea dm-Märkte Produkte Warenkorb Menü


Kostenloser Versand ab 49 € Kostenlose Rückgabe auch im dm-Markt PAYBACK: Punkte sammeln & sparen

## Suche nach „balea“

Produkte (613) Beratung (221)

Sortieren Filtern

MARKE von dm



3,95 €

Balea Urea Fußcreme 1,25 €  Balea Fuß Bimsschwamm 0,95 €  Balea Duschöl 250ml 1,85 €

Wir setzen 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 anzuzeigen. 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 €



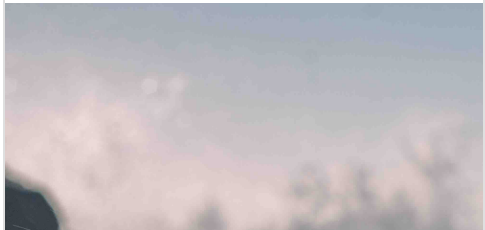
Lorem ipsum dolor sit amet

**balea product 3**  
8,65 €

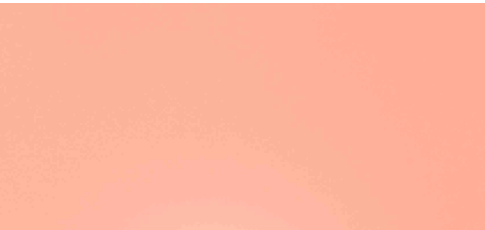


Lorem ipsum dolor sit amet

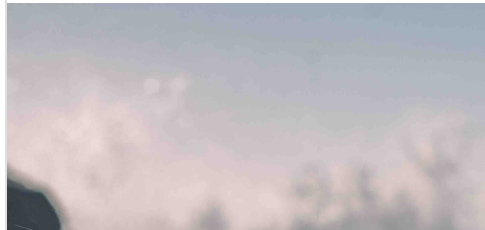
**balea product 4**  
2,95 €



**balea product 5**  
8,65 €



**balea product 6**  
2,95 €



< >

# Composition vs. Dependency Inversion

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

code ~ comparison

composition.js x

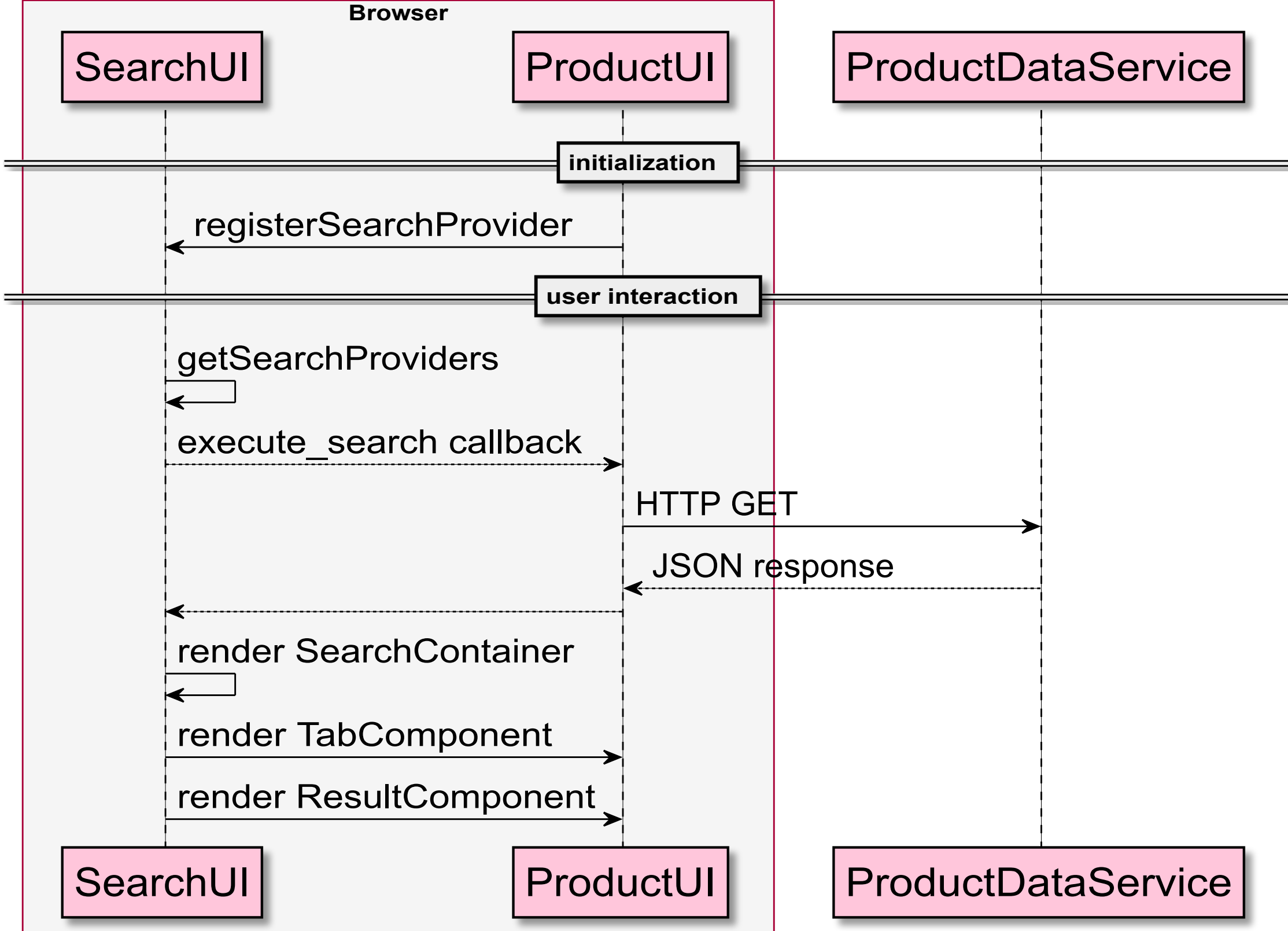
```
1 <SearchContainer>
2   <div id="search-tabs">
3     <ProductTab count="13">
4       <ContentTab count="42">
5     </div>
6     <ProductResult active/>
7     <ContentResult active/>
8 </SearchContainer>
9
10 // --- everything in one repository ---
```

code ~ comparison

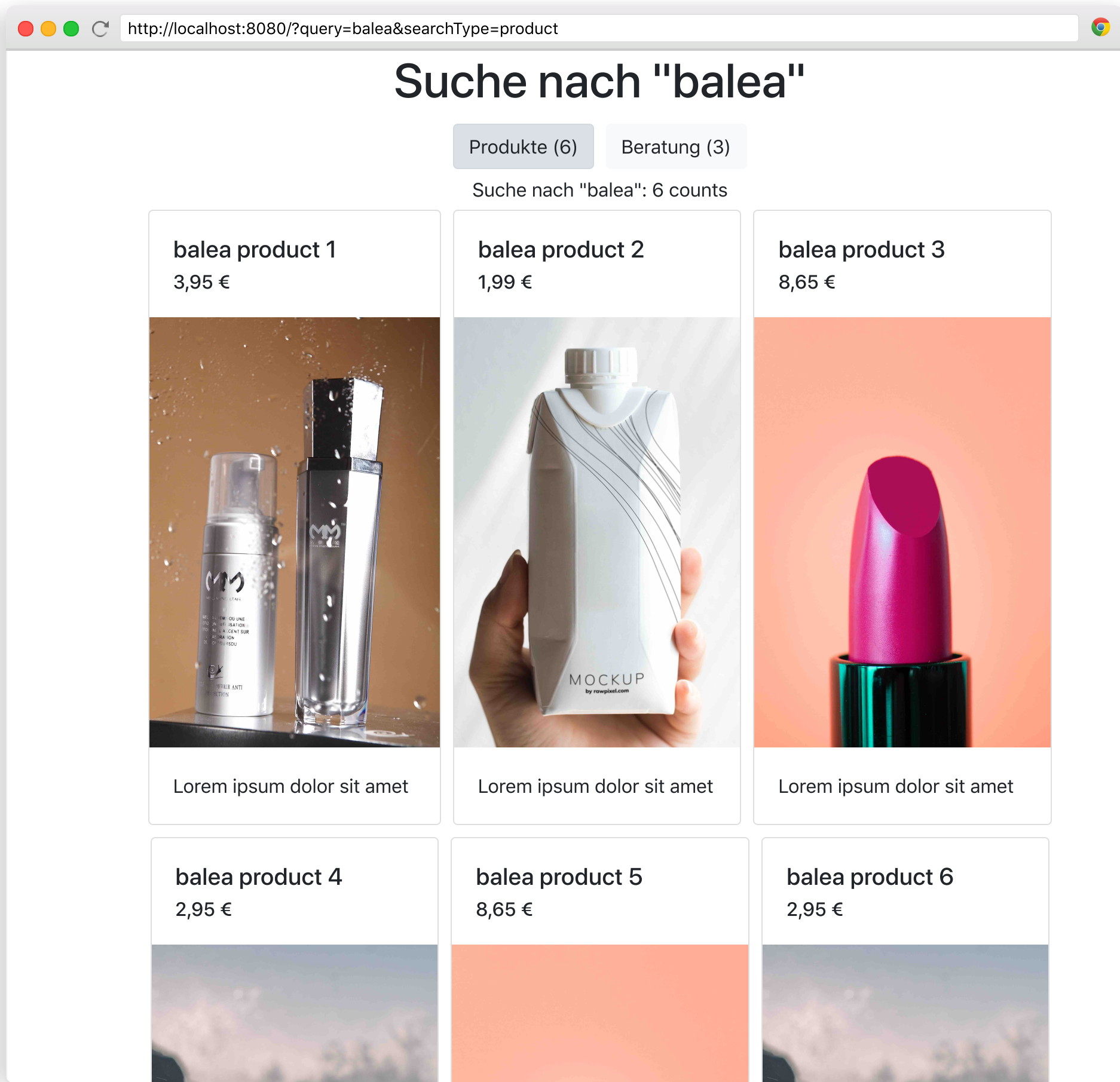
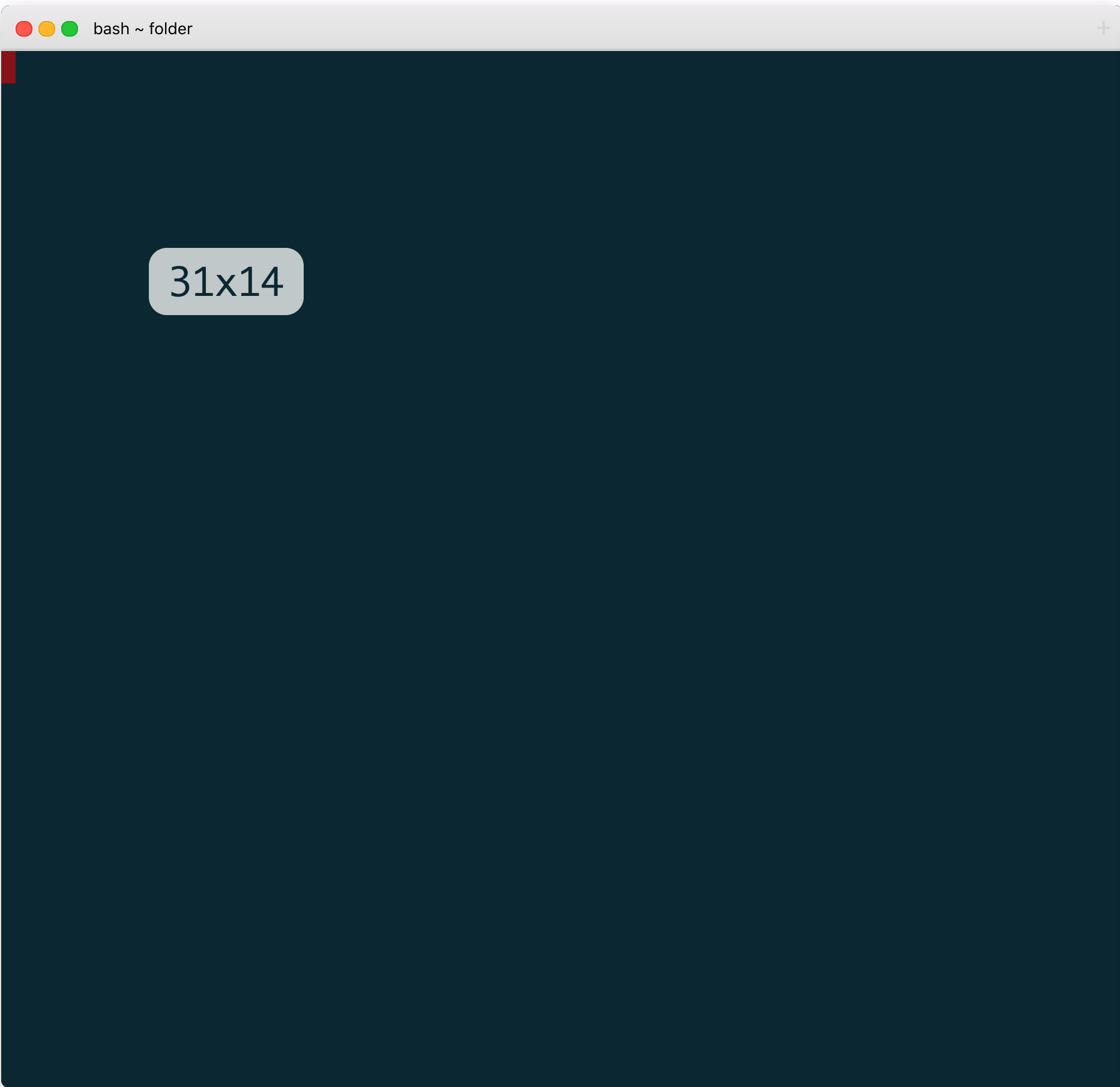
dependencyInversion.js x

```
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



# Dependency Inversion - Search-API

code ~ sources

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

```
1 import orderBy 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(orderBy);
17 };
18
19 export const removeSearchProvider = ID => {
20   delete searchProviders[ID];
21 };
```

# Dependency Inversion - Produkt

code ~ sources

product/client/src/ProductSearchInitializer.jsx x

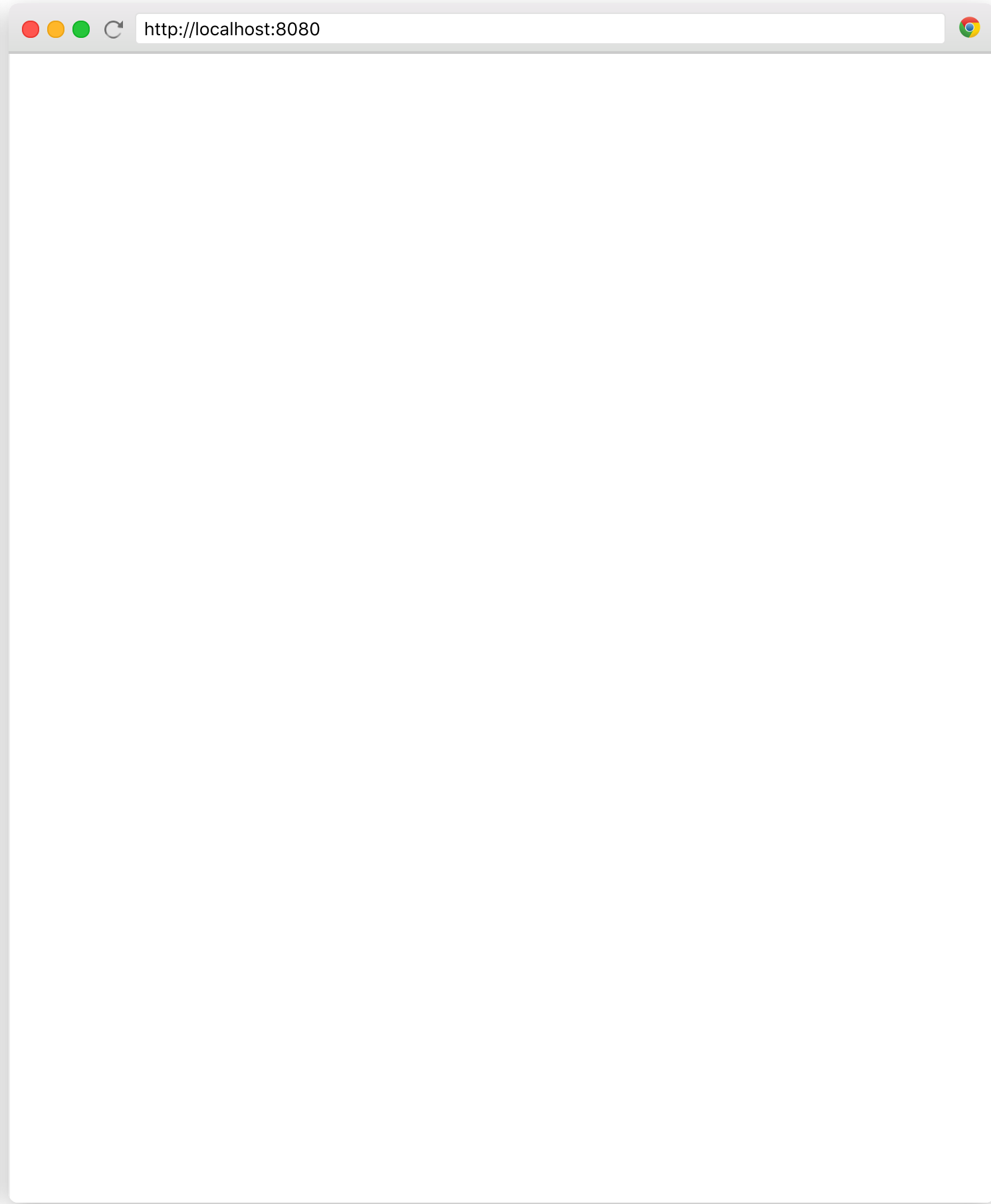
```
1 import React from 'react';
2 import { registerSearchProvider, removeSearchProvider } from 'search-api';
3 import { executeProductCount, executeProductSearch } from './search';
4 import ProductSearchTab from './ProductSearchTab';
5 import ProductSearchResult from './ProductSearchResult';
6
7 export 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

```
code ~ sources
search/client/src/components/SearchContainer.jsx x search/client/src/components/state/actions.js

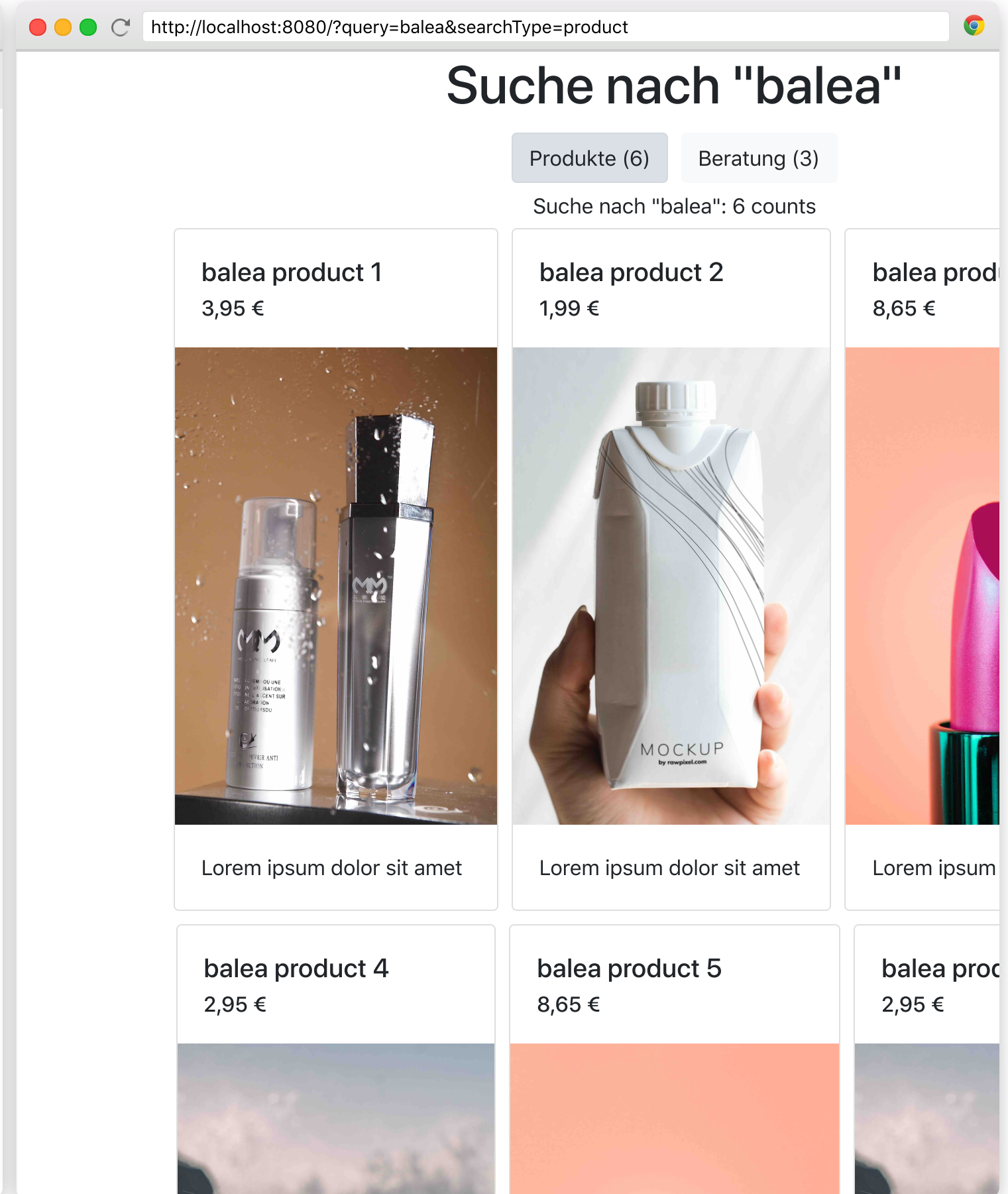
1 import React, { useEffect } from 'react';
2 import qs from 'qs';
3 import { getSearchProviders } from 'search-api';
4 import SearchResultHeader from './SearchResultHeader';
5 import SearchResultBody from './SearchResultBody';
6 import { doLoadCount, doLoadData } from './state/actions';
7 import isEmpty 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()
```



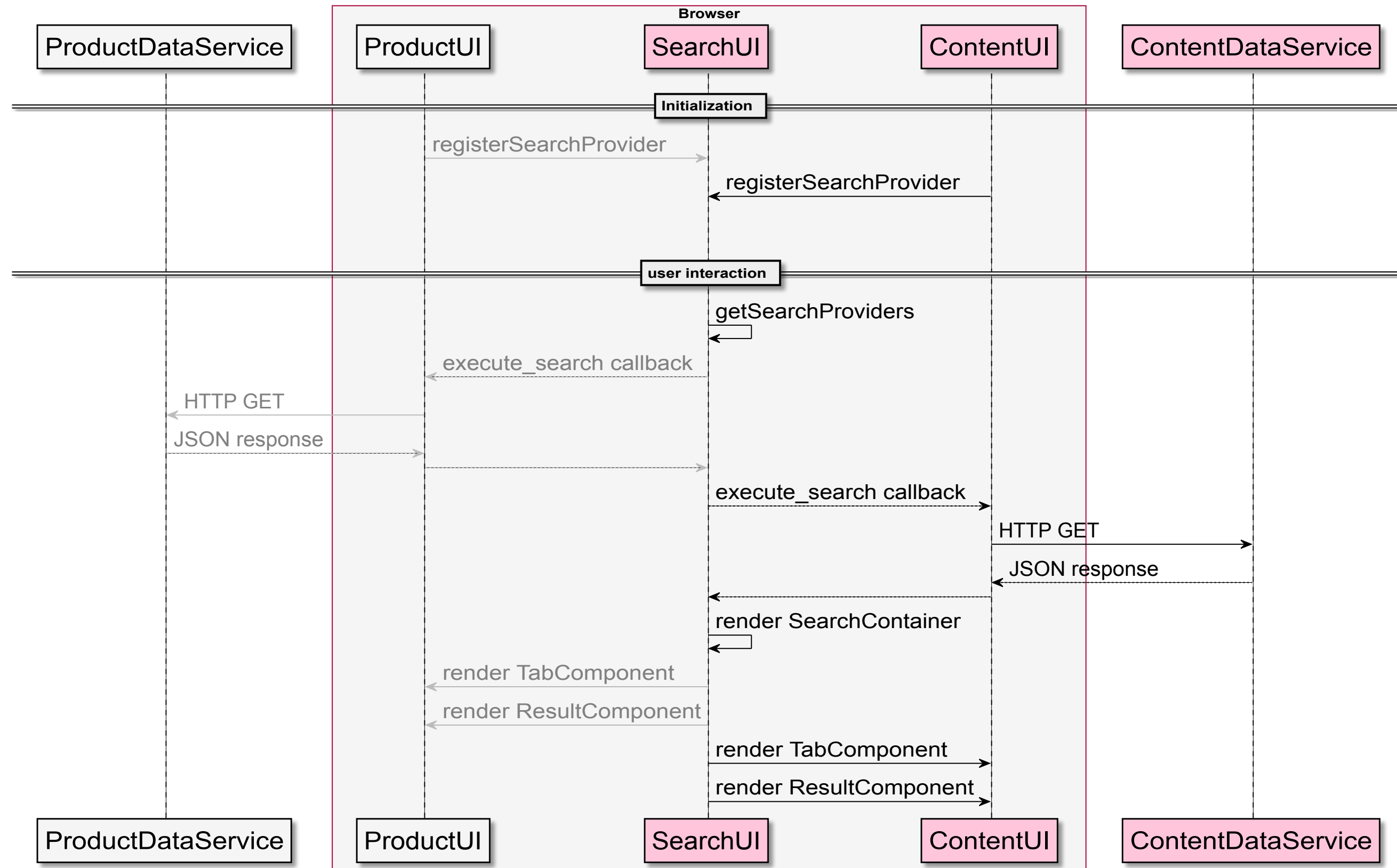
# Dependency Inversion - Suche

```
code ~ sources
search/client/src/components/SearchContainer.jsx x search/client/src/components/SearchResultHeader.jsx search/client/src/components/Se...

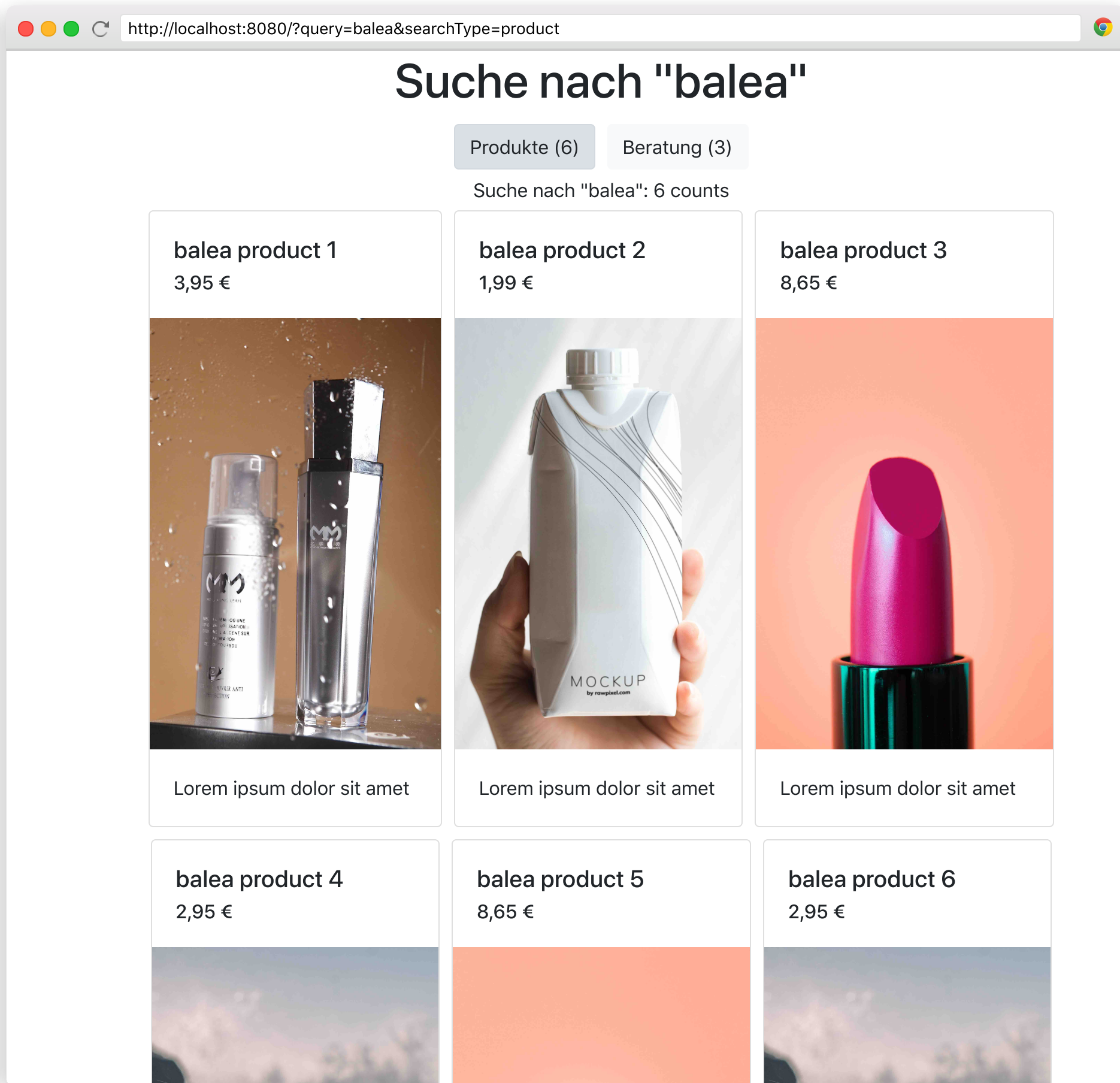
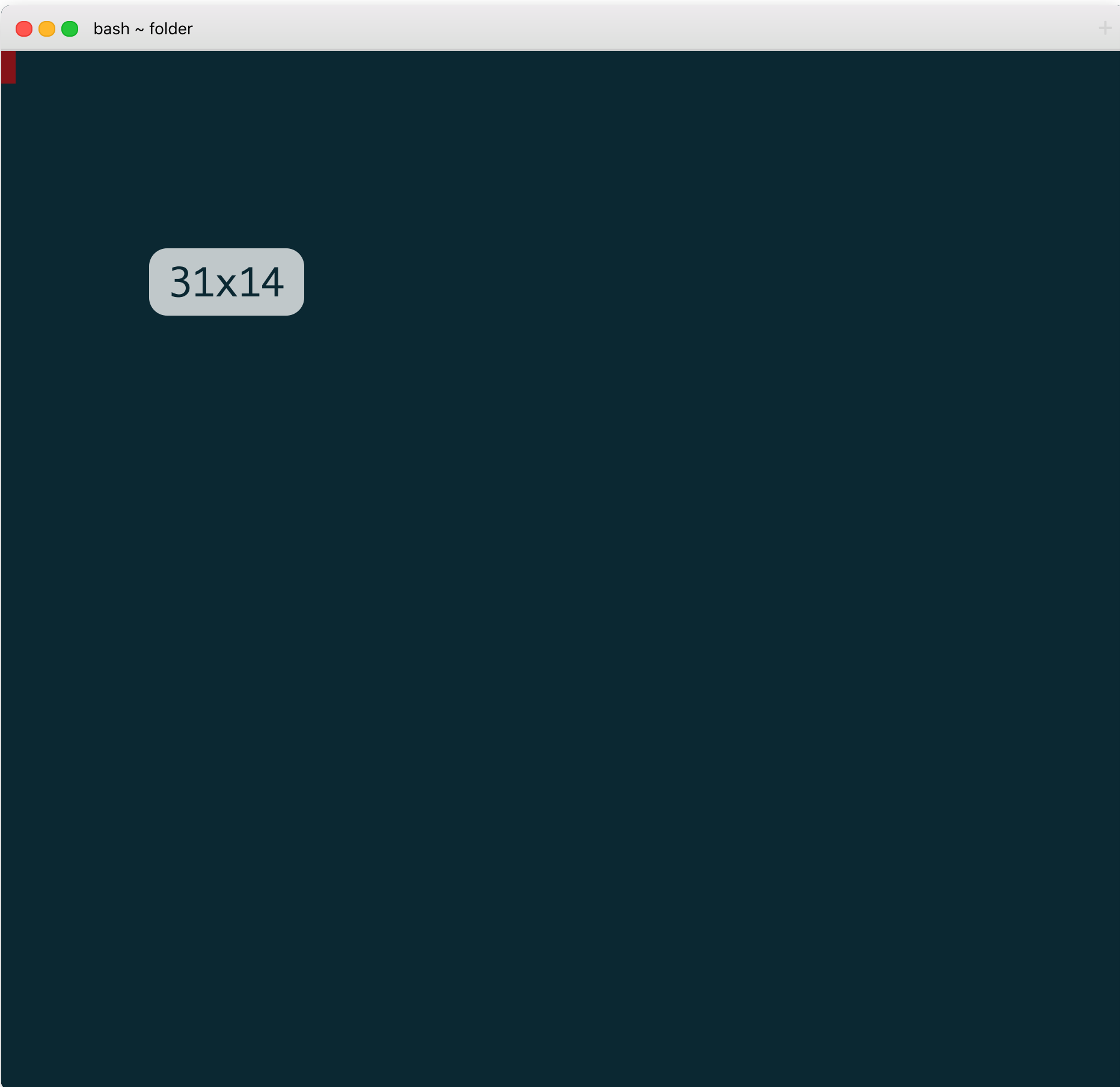
1 import React, { useEffect } from 'react';
2 import qs from 'qs';
3 import { getSearchProviders } from 'search-api';
4 import SearchResultHeader from './SearchResultHeader';
5 import SearchResultBody from './SearchResultBody';
6 import { doLoadCount, doLoadData } from './state/actions';
7 import isEmpty 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()
```



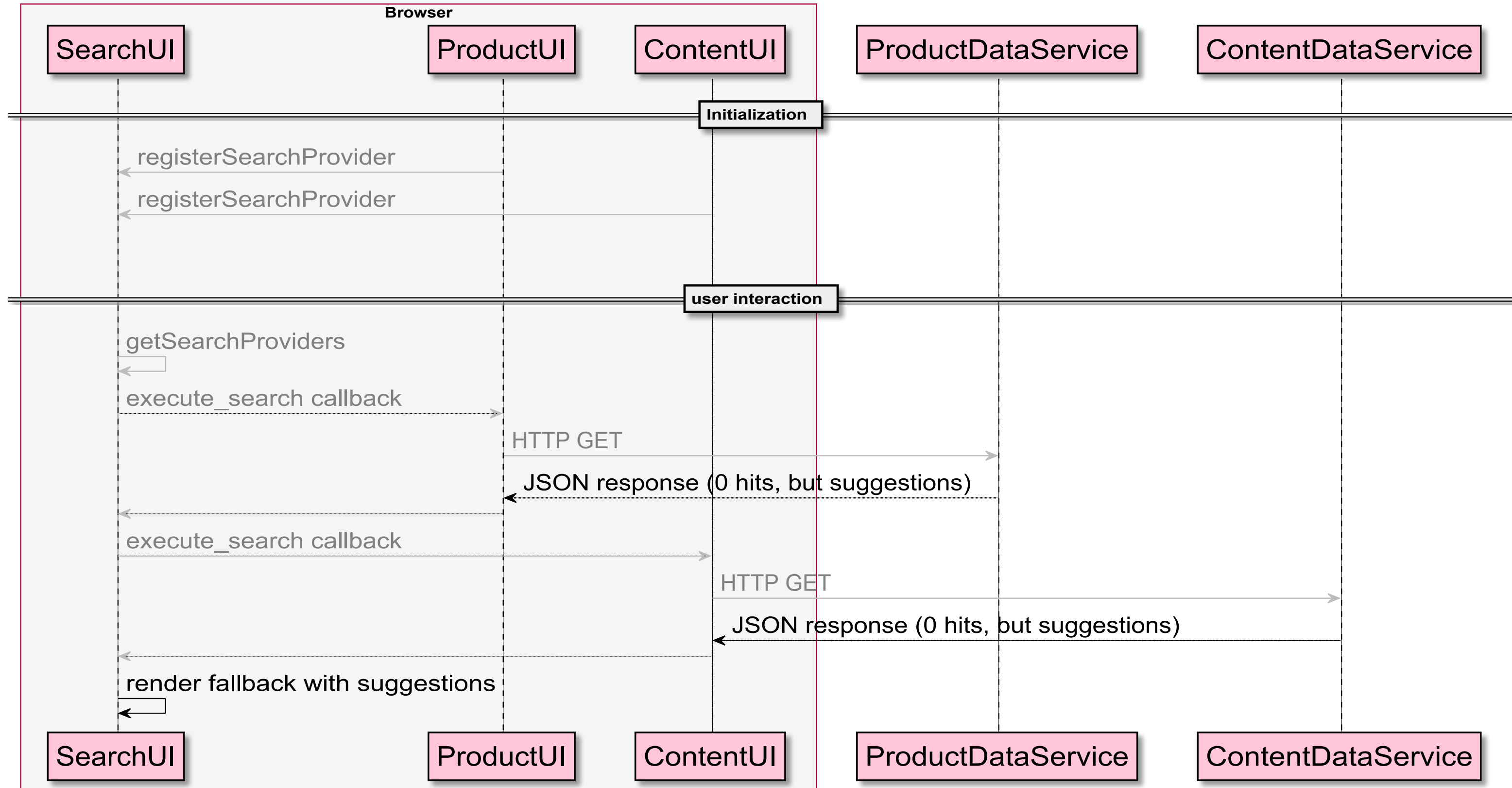
# ... und jetzt noch mit Provider für Contentsuche



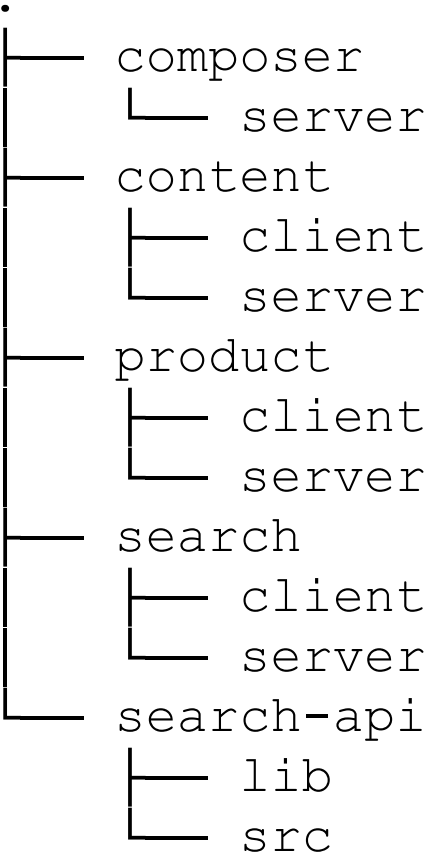
# .. und jetzt noch mit Provider für Contentsuche



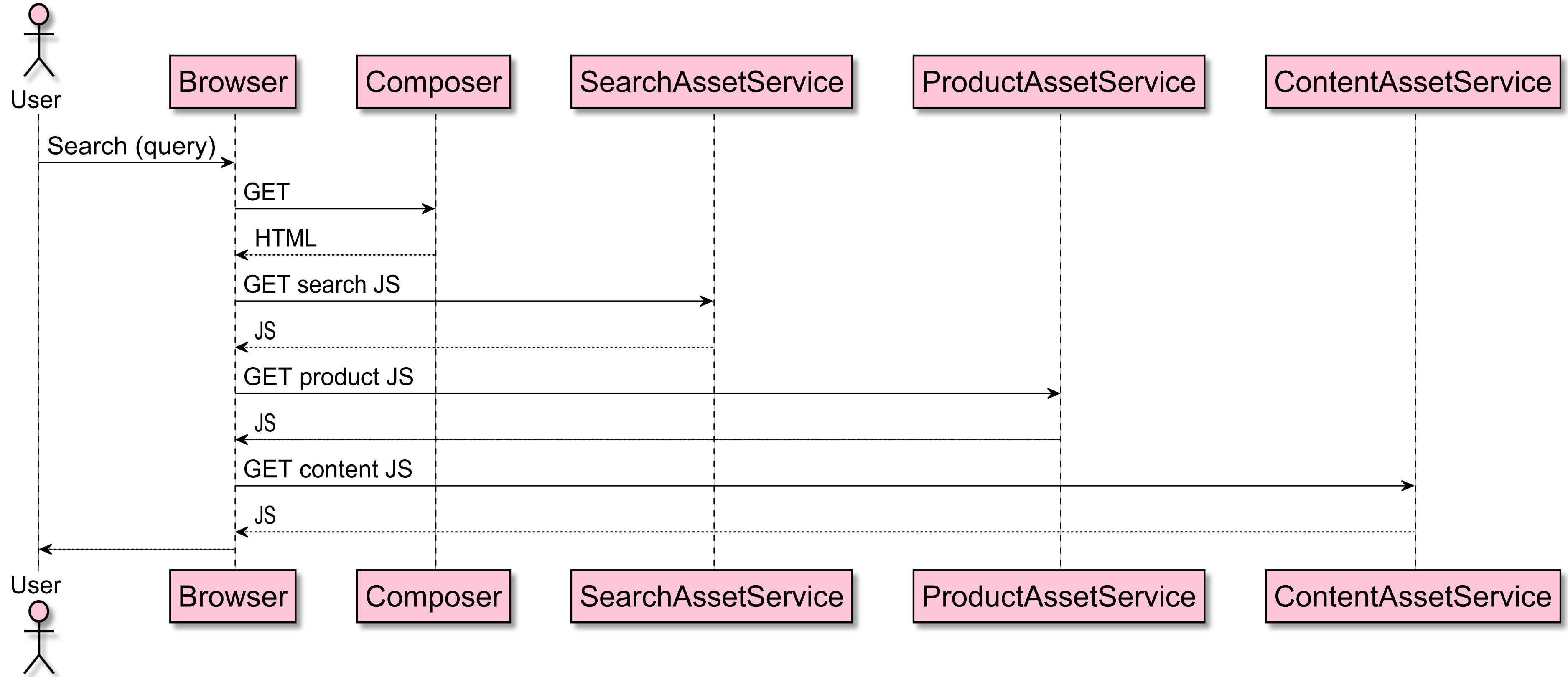
# ... 0-Treffer -> Fallback und Suchvorschläge



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



# HTML und JS laden





## **Composition**

Kein unabhängiges Deployment



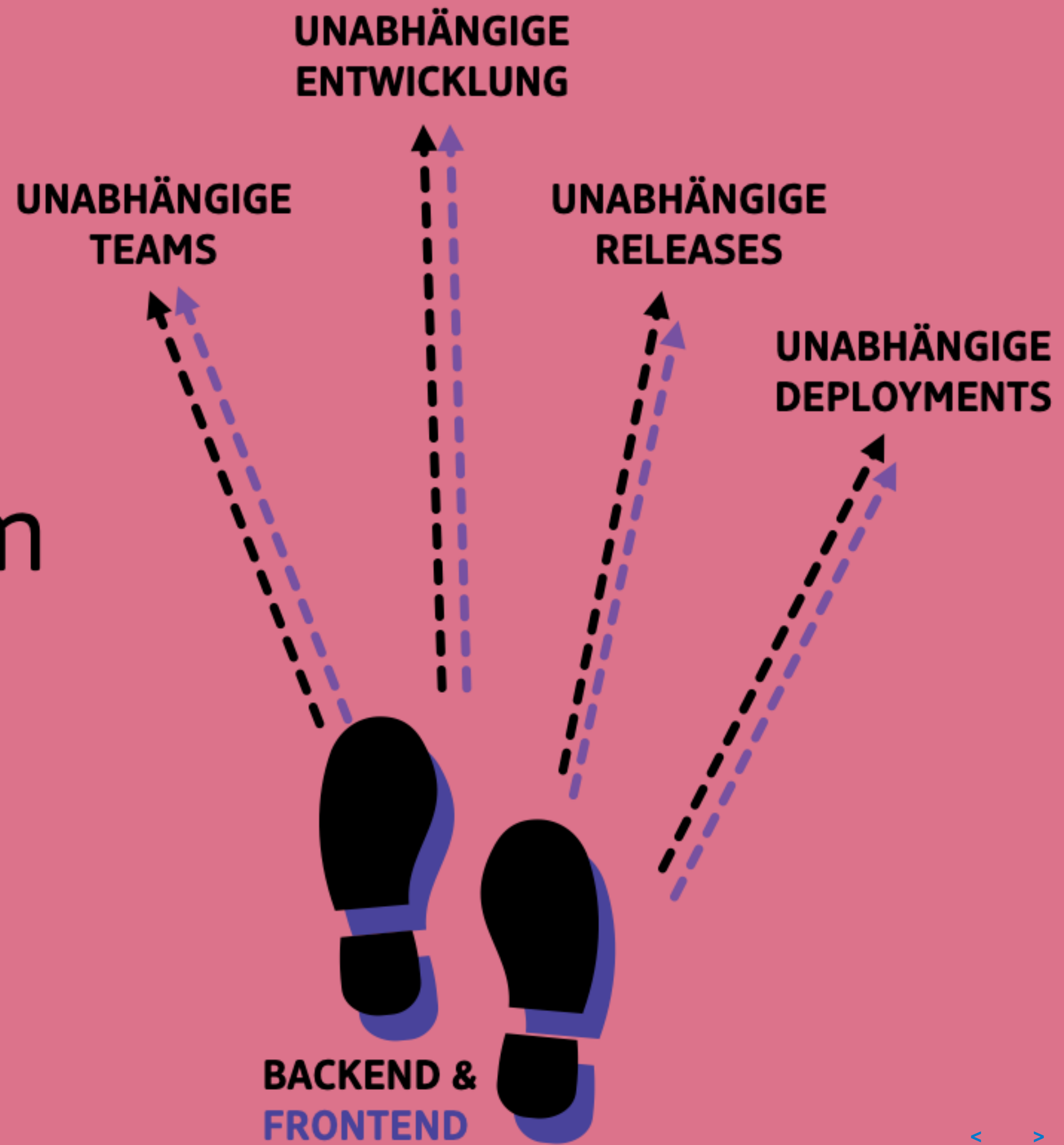
## **Dependency Inversion**

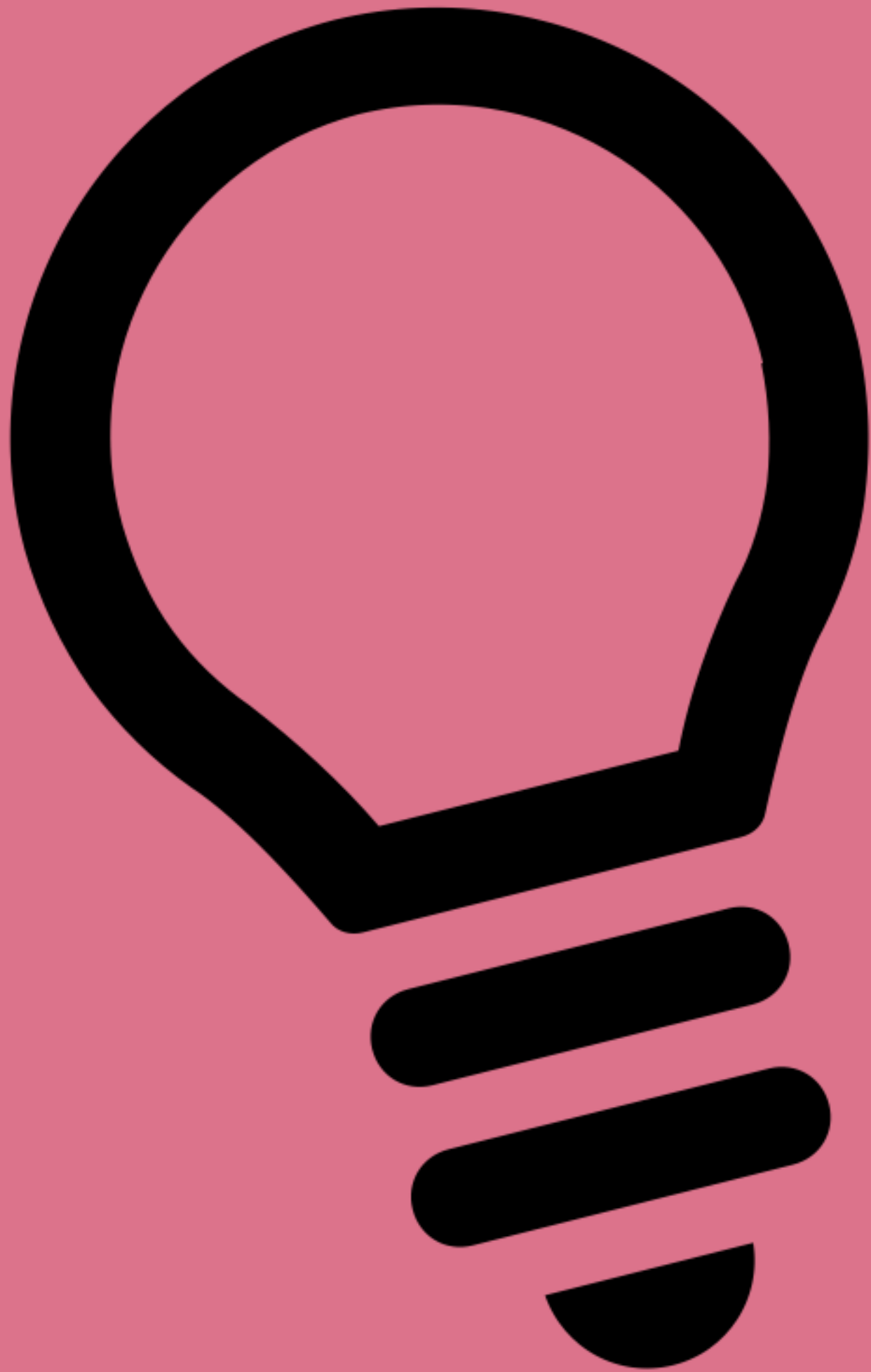
Unabhängiges Deployment

Runtime Composition



# Unabhängigkeit im Back- & Frontend





# Lessons Learned

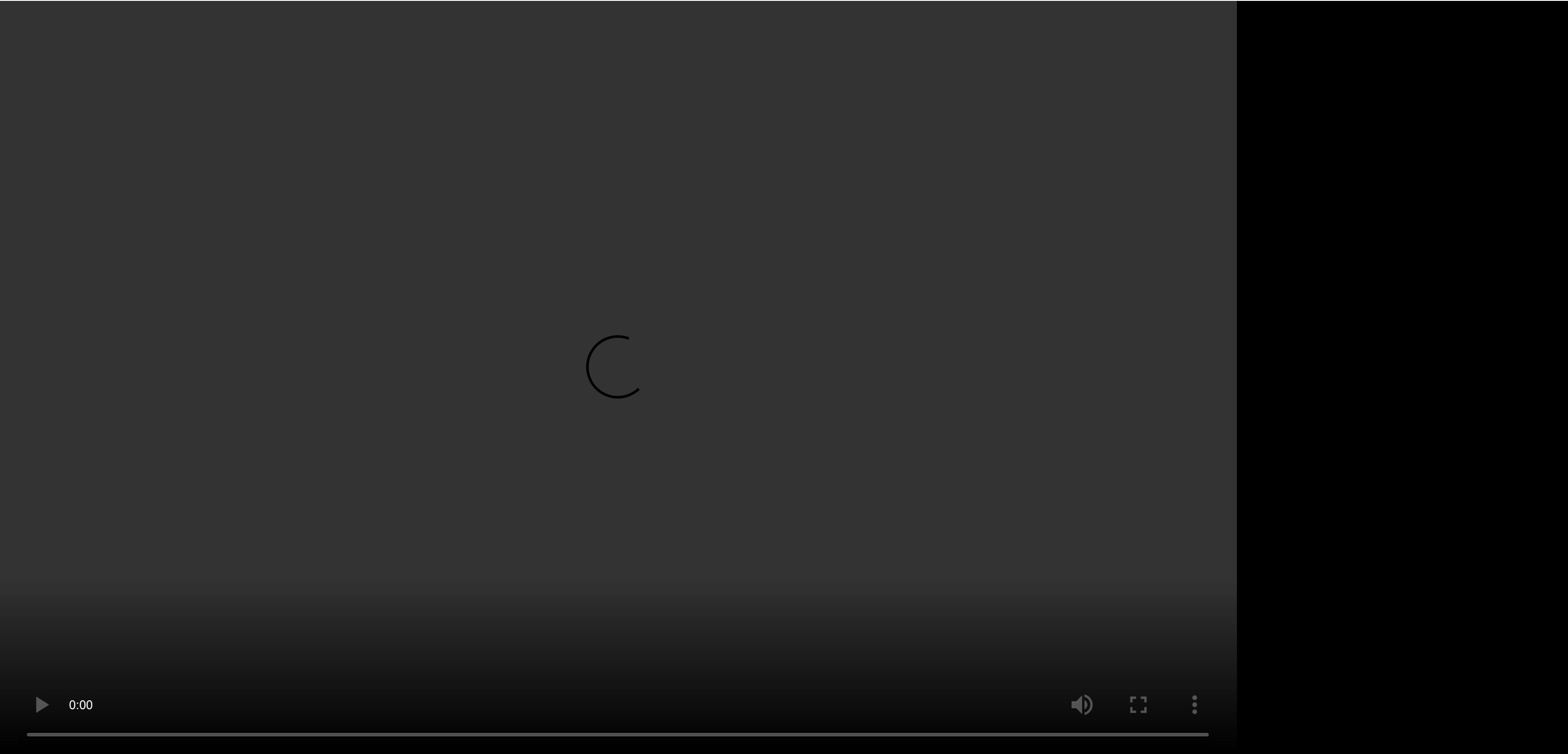
Vorteil umso größer, **je größer** das Projekt

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

**Umdenken** im Programmierparadigma fällt oft schwer

Einfache Skalierung, auch für weitere Apps - SEINZ.

---



# Wie geht's weiter?

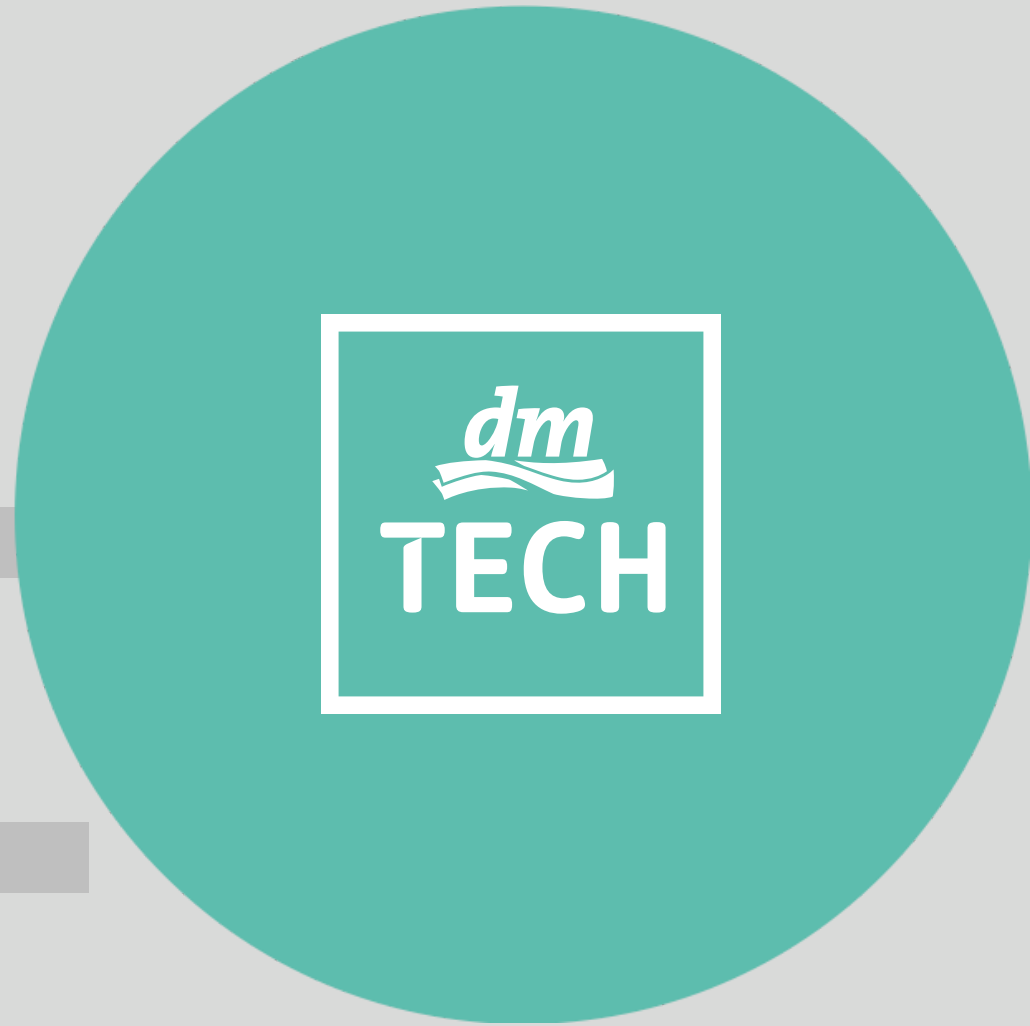
**Ablösung CMS** als Composer

**SSR** für ersten Seitenaufruf

**Frontend-seitiges Routing** für alle  
Uls von dm.de

**DANKE!**





dmtech.de



synyx.de

