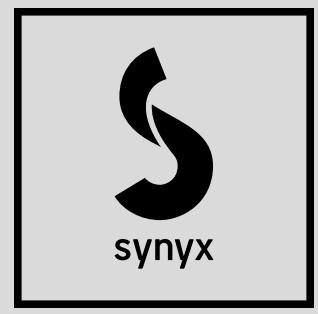


# MICRO-FRONTENDS IN REACT



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



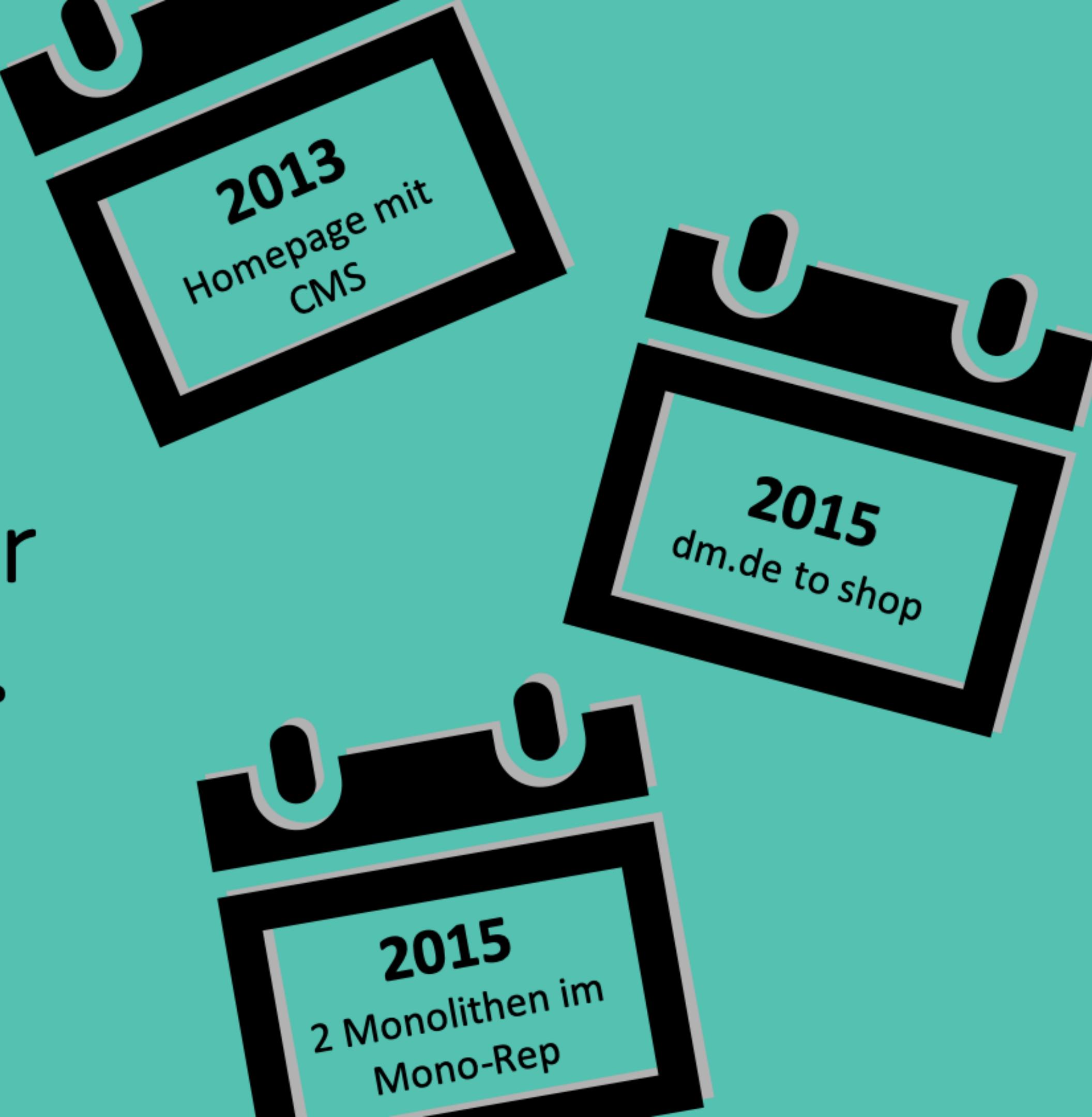
**Benjamin Seber**  
[@\\_seebaer](https://twitter.com/_seebaer)



# RÜCKBLENDE

---

# Was bisher geschah...

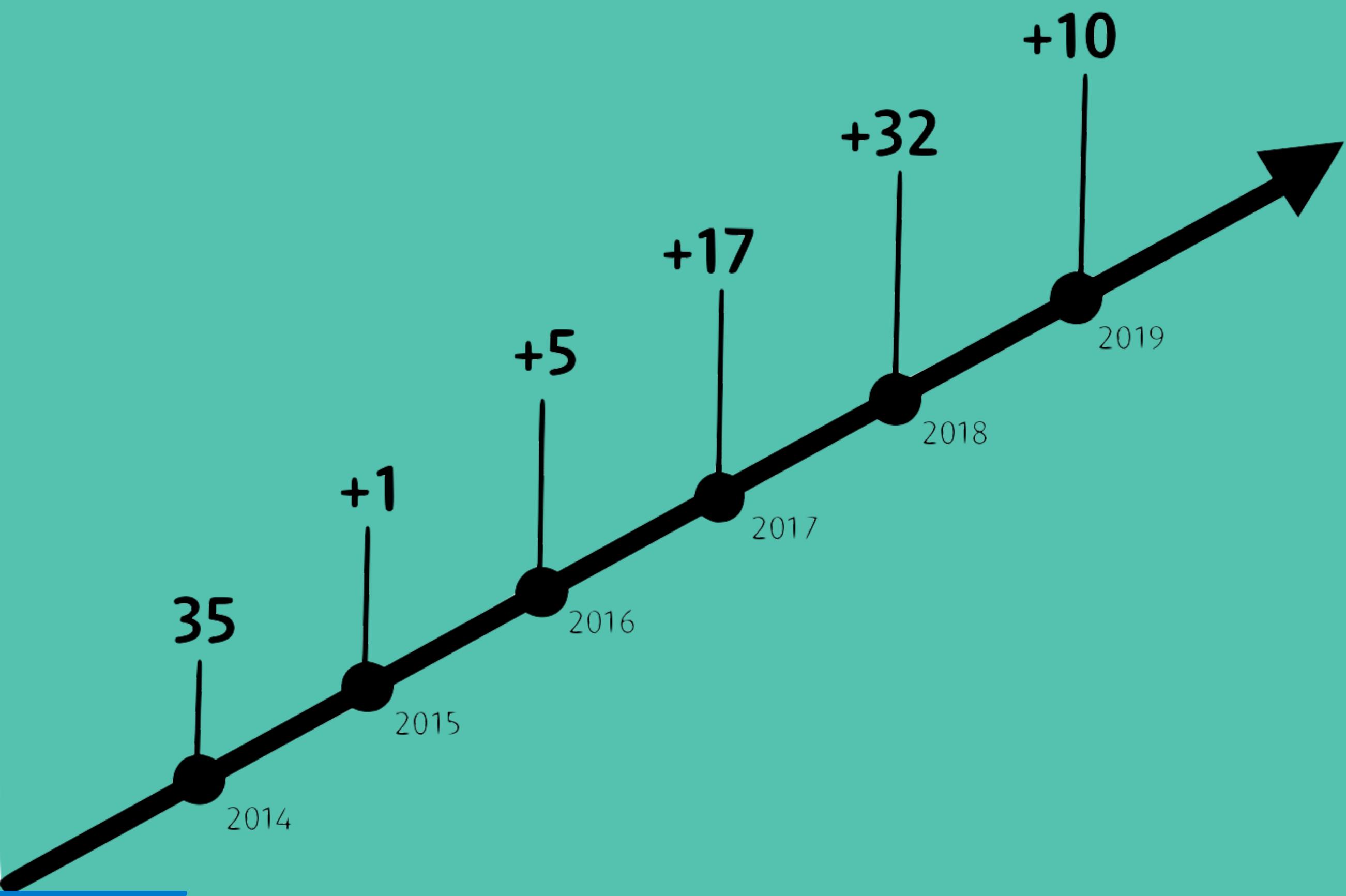


# CoreMedia Git Historie

- 2013



2013-05-14 - 13:17 36c12ee9120e0dcef5c43e1  
2013-05-13 - 14:28 906b6be40bc01f17fcda2673fb  
2013-05-13 - 14:23 c098905fdb1c17fd8dce9593fc74  
2013-05-13 - 06:37 7f1bddbe57f5282a9239a0baacbae71  
\* Mon May 2013-05-13 - 06:36 0e0275dd95646c9fc1321bf93648e82  
\* Mon May 2013-05-10 - 14:38 8964f525b9726a68428e596e55b01f0813  
\* Mon May 2013-05-10 - 14:24 074c37b8d5d5abfb364d92725a344f87e2b  
\* Mon May 2013-05-10 - 12:40 f66bc1c54c46d84f6665cd276cd8e2fb9a28  
\* Thu May 2013-05-09 - 13:34 01a817ecf6f88d3c59aab69ac22f0a7a3f4ce  
\* Wed May 2013-05-08 - 16:57 8d35cd896fba908835a8b5012d11966973e30a  
\* Wed May 2013-05-08 - 09:34 2778dccadd8b015c17fd27b476fa5ea03716410  
\* Wed May 2013-05-08 - 08:26 44d132c640830dbdb0d4d94649ff0156f941064  
\* Tue May 2013-05-07 - 18:37 82ac7fc59309fccffd87379f0e2cdbacbb7d02e  
\* Mon May 2013-05-06 - 16:37 3b2dfa8f7c99c6b439f2b87fcaa11c885e518a  
\* Mon May 2013-05-06 - 16:08 e3156eb80840c8577e759ab21f55455701918e94  
\* Fri May 2013-05-03 - 17:19 e8a3eea664464e0fc09ebdb604d9e9d413dbb2cc  
\* Fri May 2013-05-03 - 17:16 b3d7d0c38d4ded5c56ba983ea38c07094f032021  
\* Fri May 2013-05-03 - 14:52 b8457c803b0e8430ab4838945867b16dd063bd0  
\* Thu May 2013-05-02 - 17:53 4c190f4cae9346a634e6b61e118147f2d91176f  
\* Thu May 2013-05-02 - 17:42 027f4f4a213b7b0e3b83dca239d5c637108b5a  
\* Thu May 2013-05-02 - 14:27 d0241edc44460795ef7b1d66751f3441503a64  
\* Mon Apr 2013-04-29 - 16:19 3215bc364646d79f36def6342a3eee3a6c0d5  
\* Mon Apr 2013-04-29 - 16:18 e58c0d746dd86130d1767fe14fc5a36ae9f  
\* Apr 2013-04-29 - 15:53 8d6bfe2415c32d9c338bad543535af68617  
\* Apr 2013-04-29 - 15:00 23079093b029198af87944df37d38ee70  
\* Mon Apr 2013-04-29 - 14:57 dacaa810a76a1f237292a0443c0bb4e  
\* Mon Apr 2013-04-29 - 13:05 56f83a9a9bddae49c33341bae038f7  
\* Mon Apr 2013-04-29 - 10:05 b55583fa3f00f98f3599f307457  
\* Mon Apr 2013-04-29 - 08:31 c18407604b50b262a3ac7f87  
\* Mon Apr 2013-04-29 - 08:08 3985d98ecc7d781855674  
\* Mon Apr 2013-04-29 - 12:11 22c45649d19b2321



Anstieg der  
Contributor

# CoreMedia Git Historie

## - 2016

Tue Mar 2016-03-08 - 17:17 dd252

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...

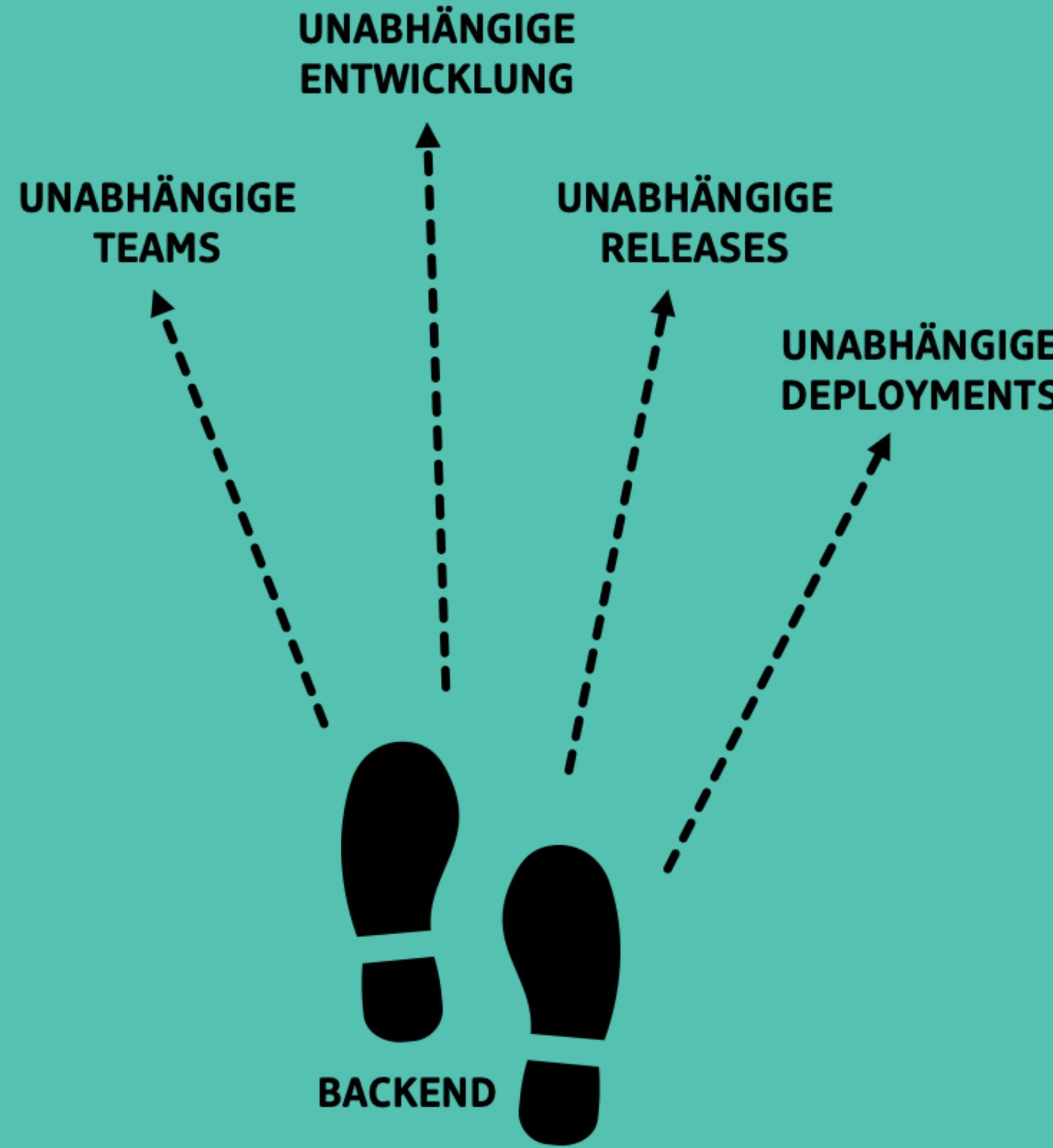




# Micro-Services im Backend



# Unabhängigkeit nur im Backend



# Skalierung im Backend

BACKEND

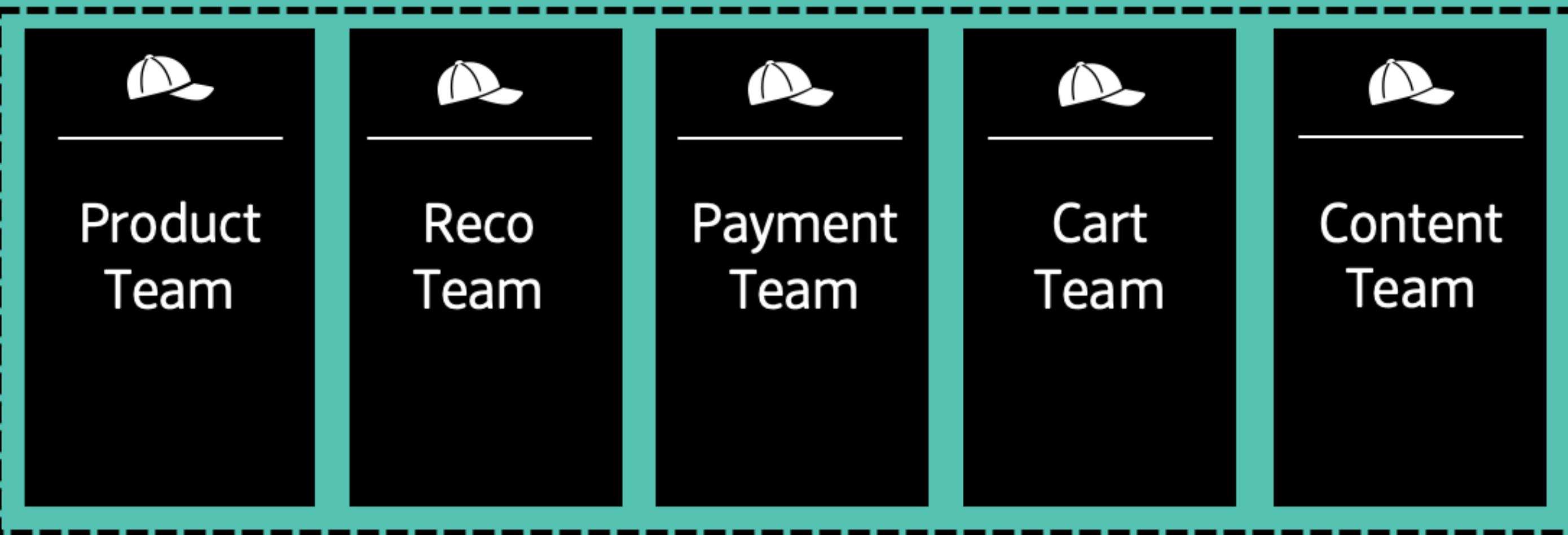


FRONTEND

Frontend-Team



Backend-Teams



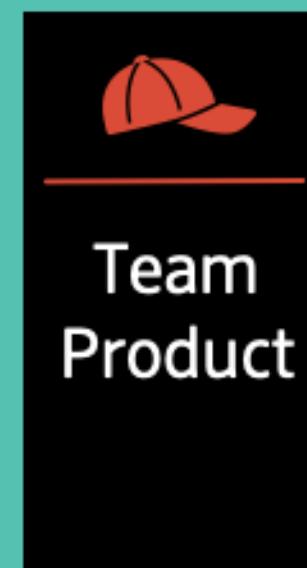
# Auswirkung für den Product Owner



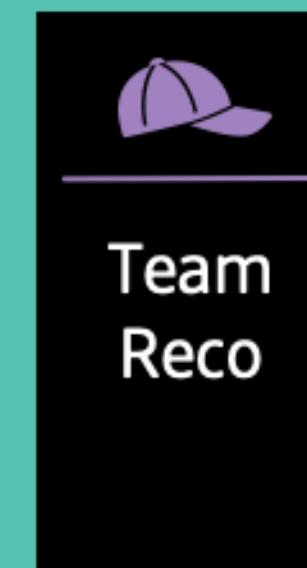


# WANTED

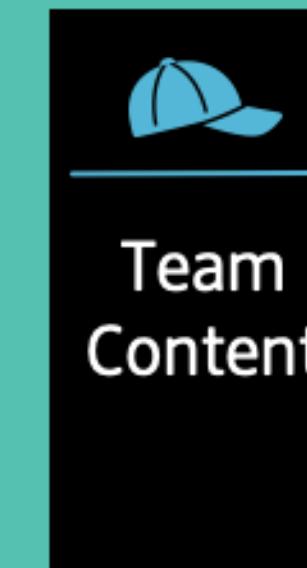
## CROSS-FUNKTIONALE TEAMS



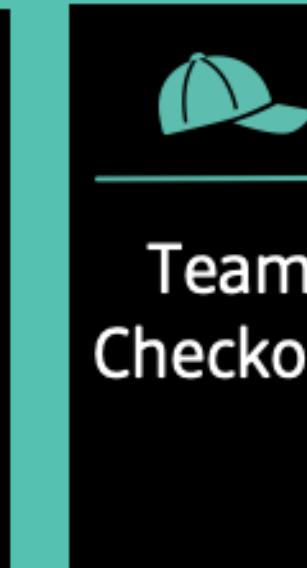
Team  
Product



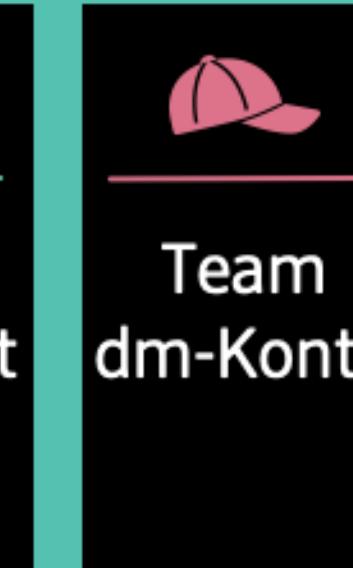
Team  
Reco



Team  
Content



Team  
Checkout

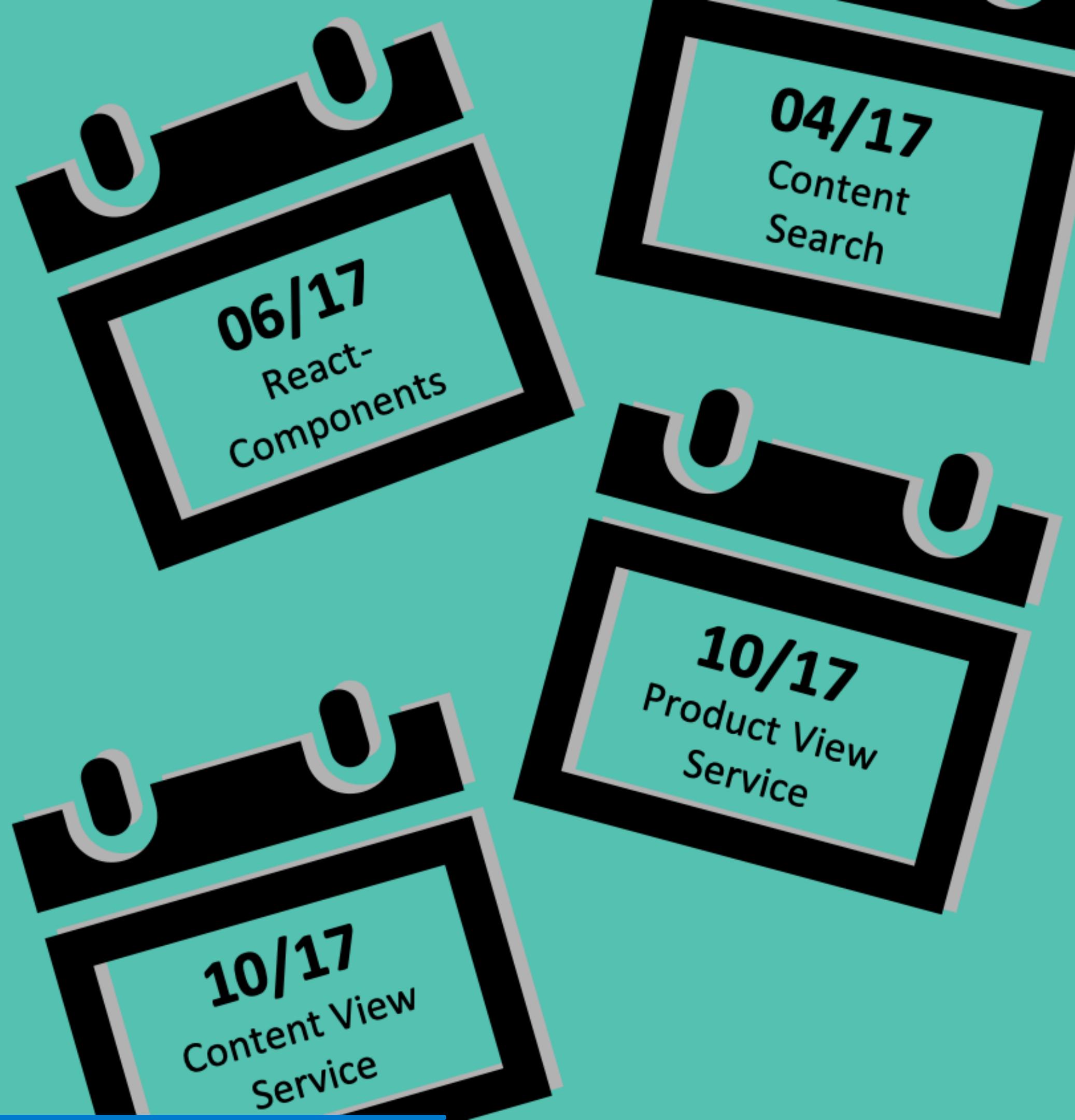


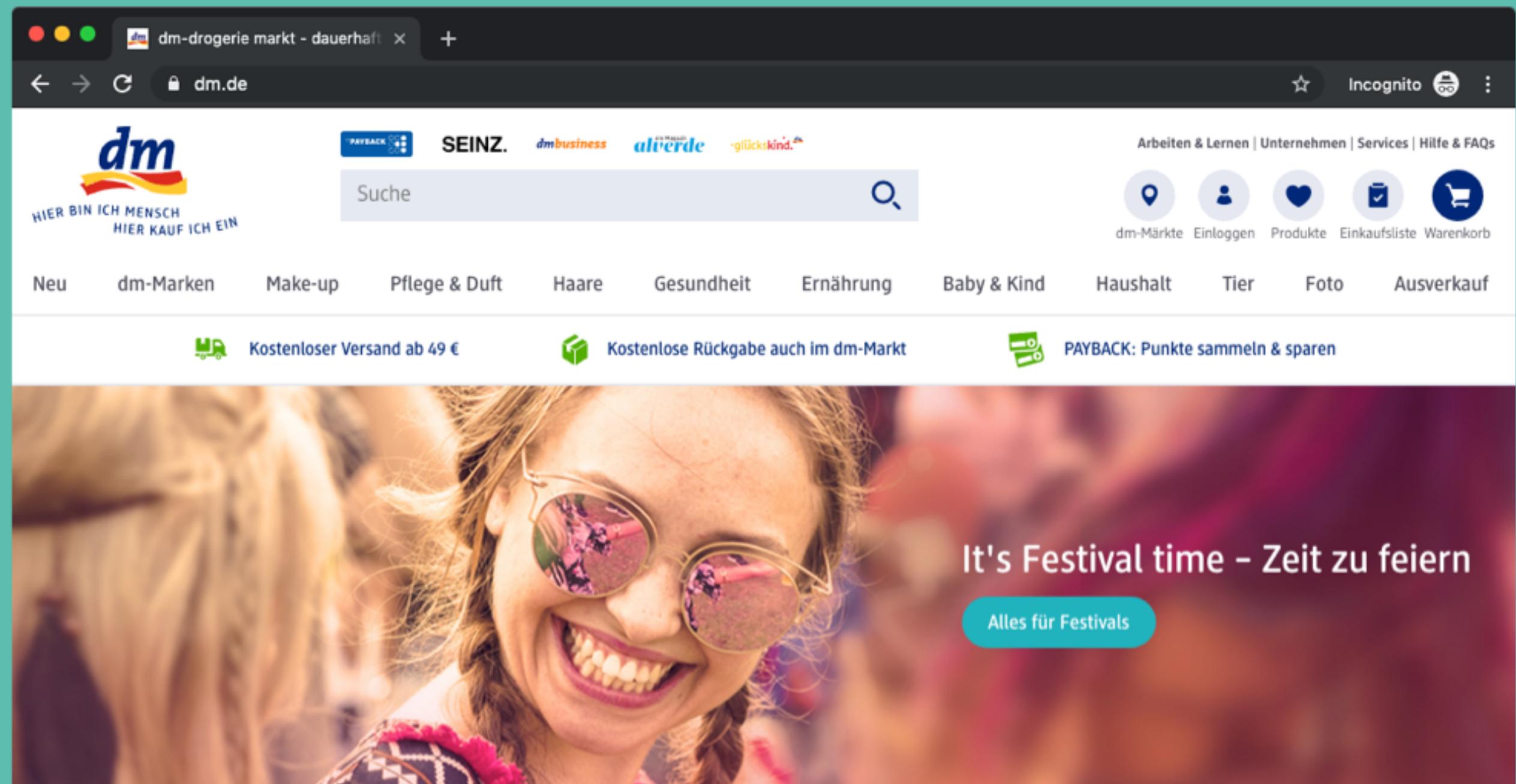
Team  
dm-Konto

## 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

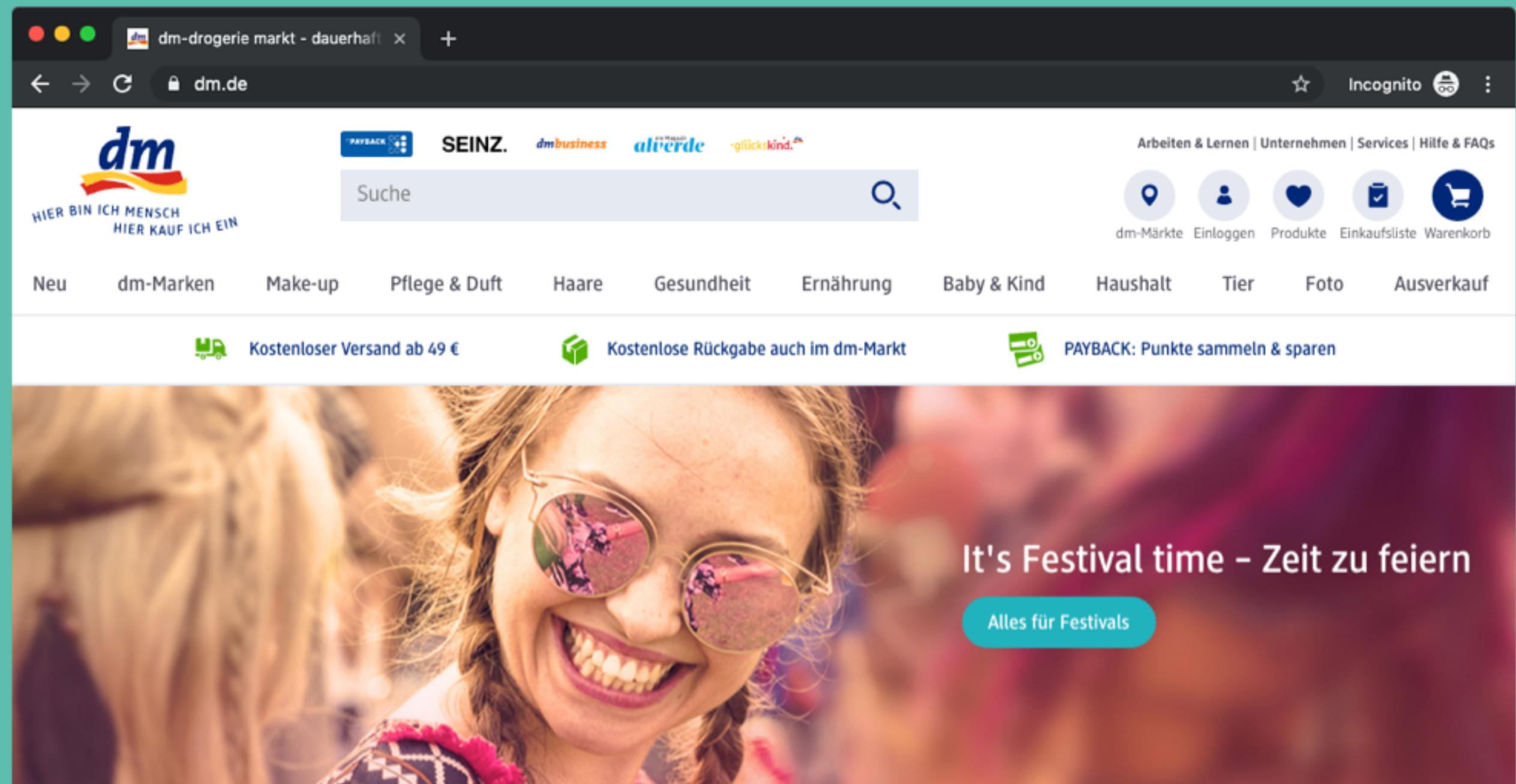
GitOverride: e( ⌂ ⌂ )đ

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

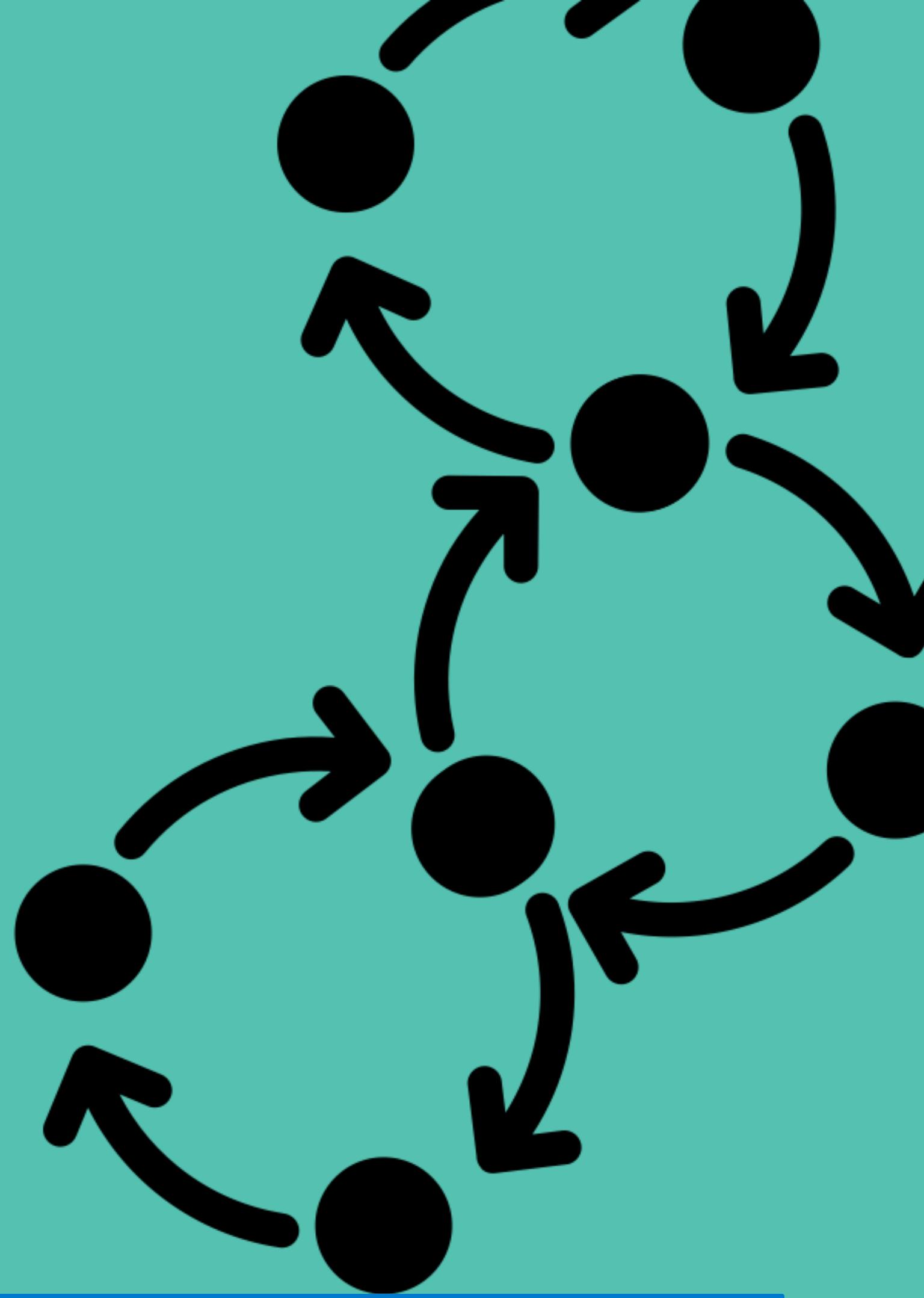


BABEL



ESLint

react-components



Aber erstes Zwischenergebnis:  
**Abhängigkeitszyklen**  
= verteilter Monolith

321 PUSH!



# DAS RÄTSEL

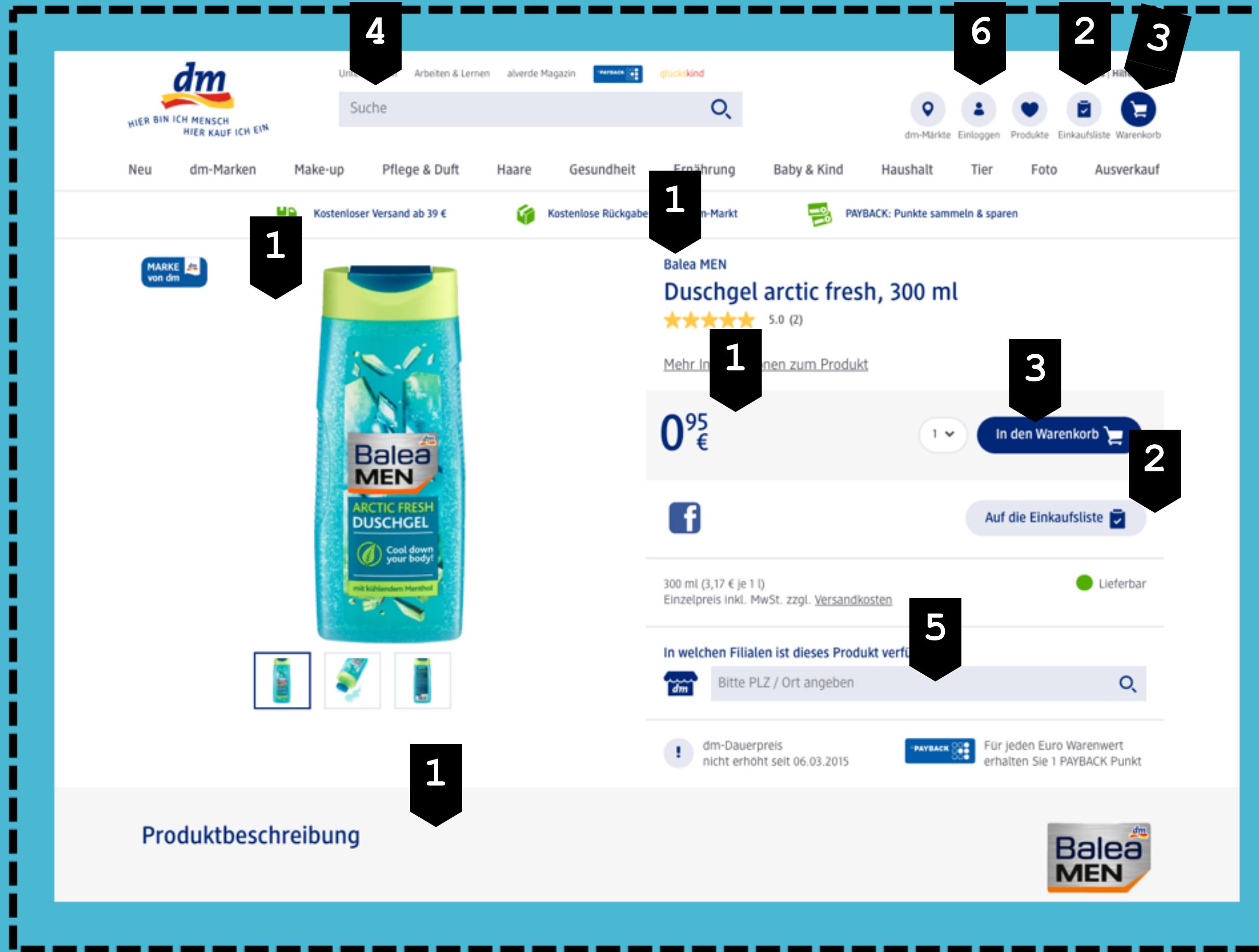
---



**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 €

2 St (1,98 € je 1 St) ★★★★☆ (196)

100 ml (1,25 € je 100 ml) ★★★★★ (12)

250 ml (0,74 € je 100 ml) ★★★★☆ (10)

150 ml (0,63 € je 100 ml) ★★★★☆ (31)

Balea Balea Balea Balea

Balea Hornhaut Balea Urea Fußcreme, Balea Duschöl 250ml, Balea erfrischendes

# Schauplatz Suche

Domain Suche (Rahmen) 1

Domain Produkt-Suche | 2

Domain Content-Suche 3

The screenshot shows the dm.de website interface. At the top, there's a navigation bar with links for SEINZ., dm-business, alverde, and glückskind.de. On the right, there are links for 'Arbeiten & Lernen | Unternehmen | Services | Hilfe & FAQs'. Below the navigation is a search bar with the word 'Balea' and a magnifying glass icon. To the right of the search bar are icons for location, user profile, heart, shopping list, and cart, with corresponding text labels: 'dm-Märkte', 'Einloggen', 'Produkte', 'Einkaufsliste', and 'Warenkorb'. The main content area has a banner for 'PAYBACK: Punkte sammeln & sparen'. A large black number '1' is overlaid on the top left of the page. Below the search bar, there's a horizontal menu with categories: Neu, dm-Marken, Make-up, Pflege & Duft, Haare, Gesundheit, Ernährung, Baby & Kind, Haushalt, Tier, Foto, and Ausverkauf. Below this menu, there are two promotional banners: one for 'Kostenloser Versand ab 49 €' and another for 'Kostenlose Rückgabe'. A large black number '2' is overlaid on the second banner. In the center, there's a search result for 'Balea Deo' with a thumbnail of a woman holding a product. A black number '3' is overlaid on the right side of this result. Below the search result, there's a section titled 'Über Balea' with a thumbnail of various Balea products. At the bottom, there's a section for 'Balea Winter' with a thumbnail of a dark square logo.

**1**

dm  
HIER BIN ICH MENSCH HIER KAUF ICH EIN

SEINZ. dm-business alverde glückskind.de

Arbeiten & Lernen | Unternehmen | Services | Hilfe & FAQs

Balea

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 PAYBACK: Punkte sammeln & sparen

**2**

**3**

Suche nach „Balea“

Anzahl 24 ▾

Sortieren nach Relevanz ▾

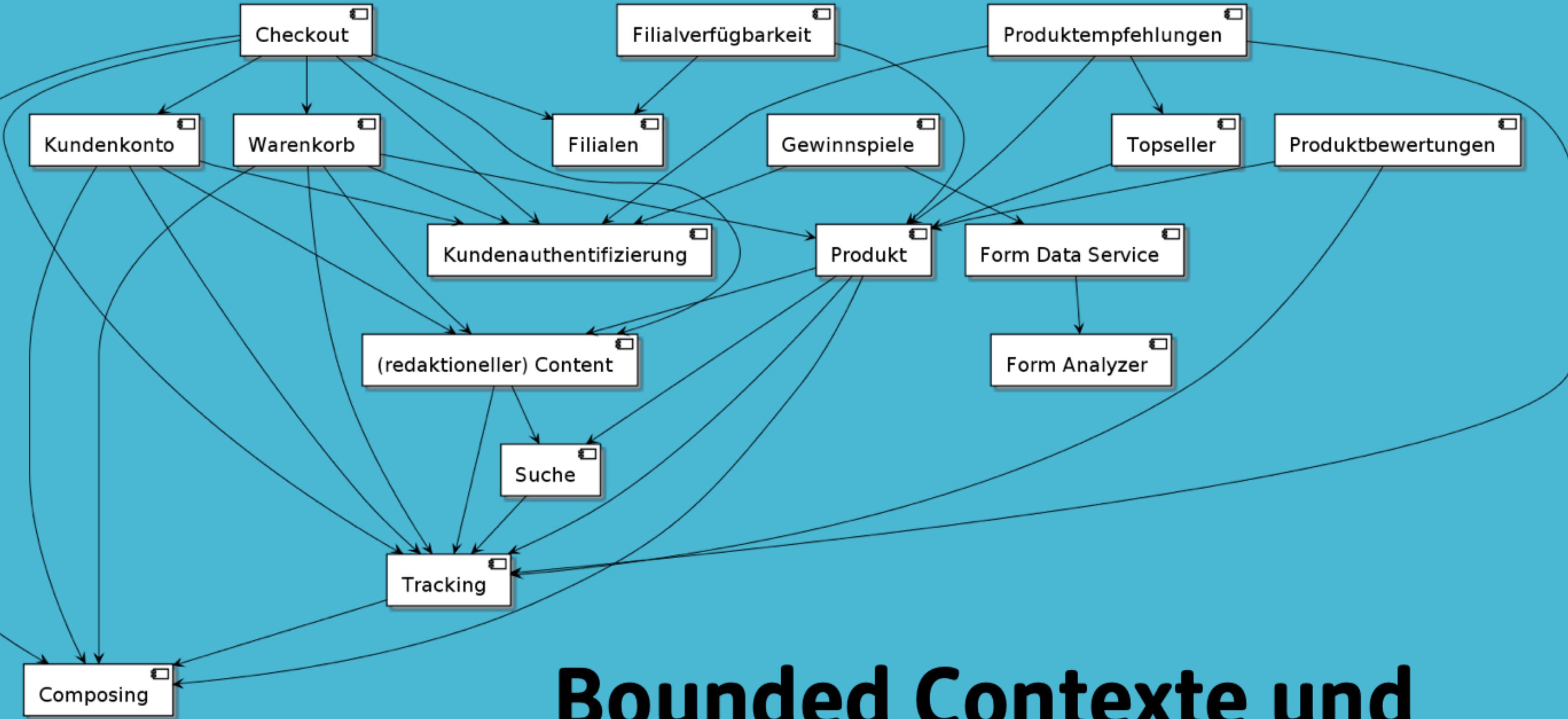
Beitragstypen

<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

Balea Deo  
22.12.2017  
Pflege & Duft  
[Seite öffnen](#)

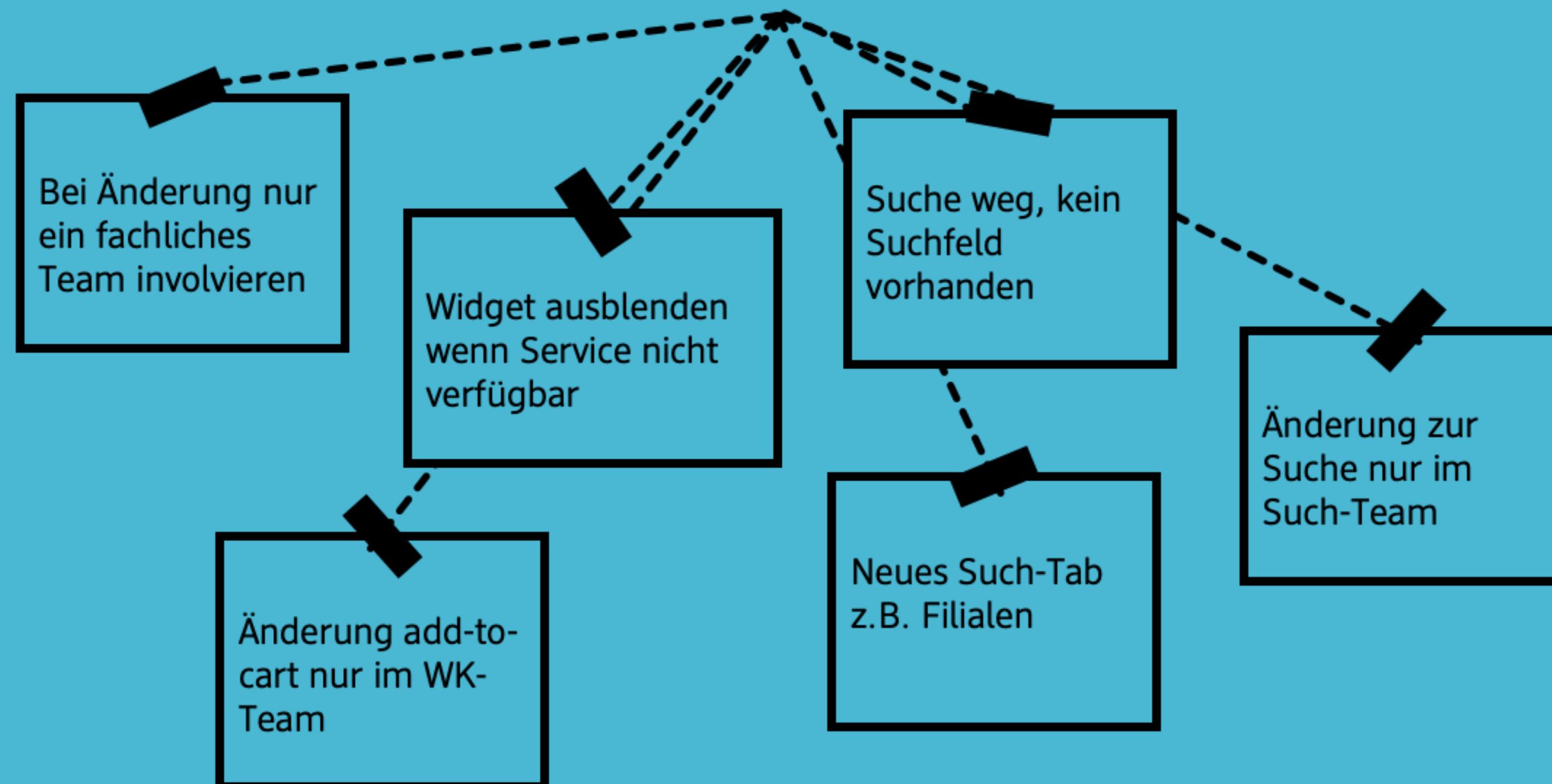
Über Balea  
11.01.2016  
Balea  
[Seite öffnen](#)

Balea Winter  
25.10.2018  
Limited Editions  
[Seite öffnen](#)



# Bounded Contexte und Abhängigkeiten bei dm.de

# Separations of Concerns



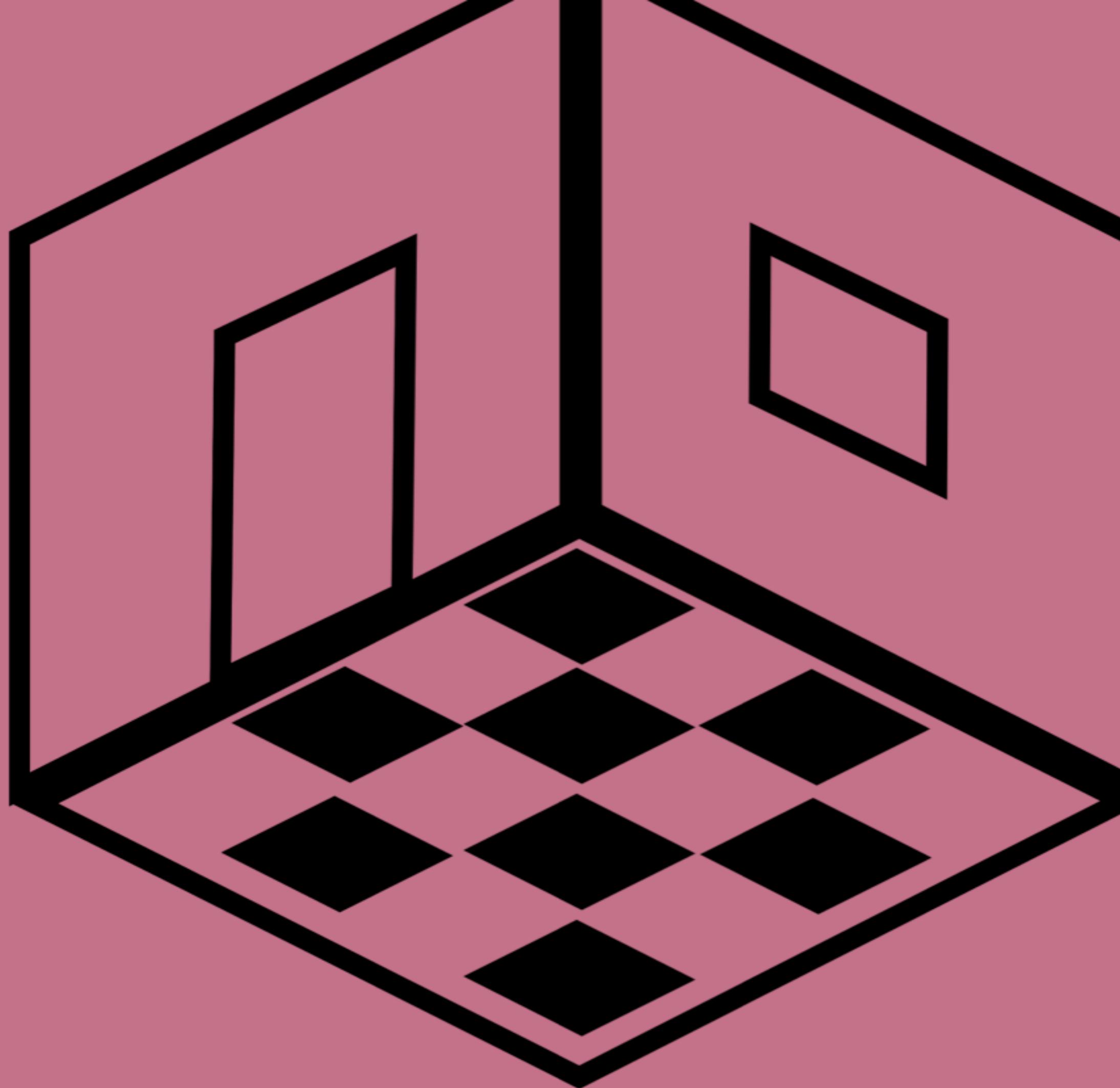
# ? ! DIE LÖSUNG

---

# Lösungs- Rahmen

Überwiegend clientseitige  
Integration

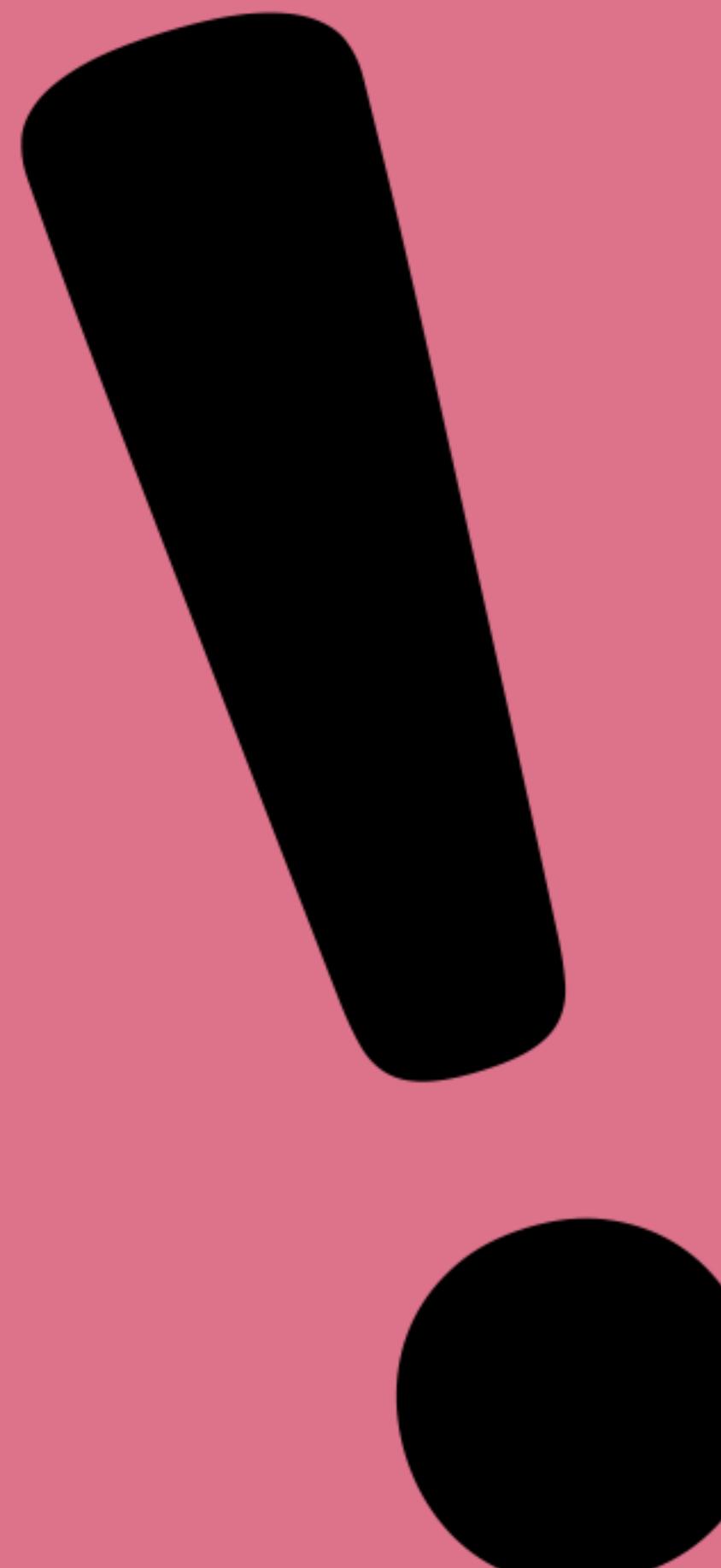
- Nur **eine** Technologie -  React
- aus Performance-Gründen nicht x Frameworks in die Seite laden
  - Synergien (Know-How, UX-Komponenten)





**Auf den  
zweiten Blick...**

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

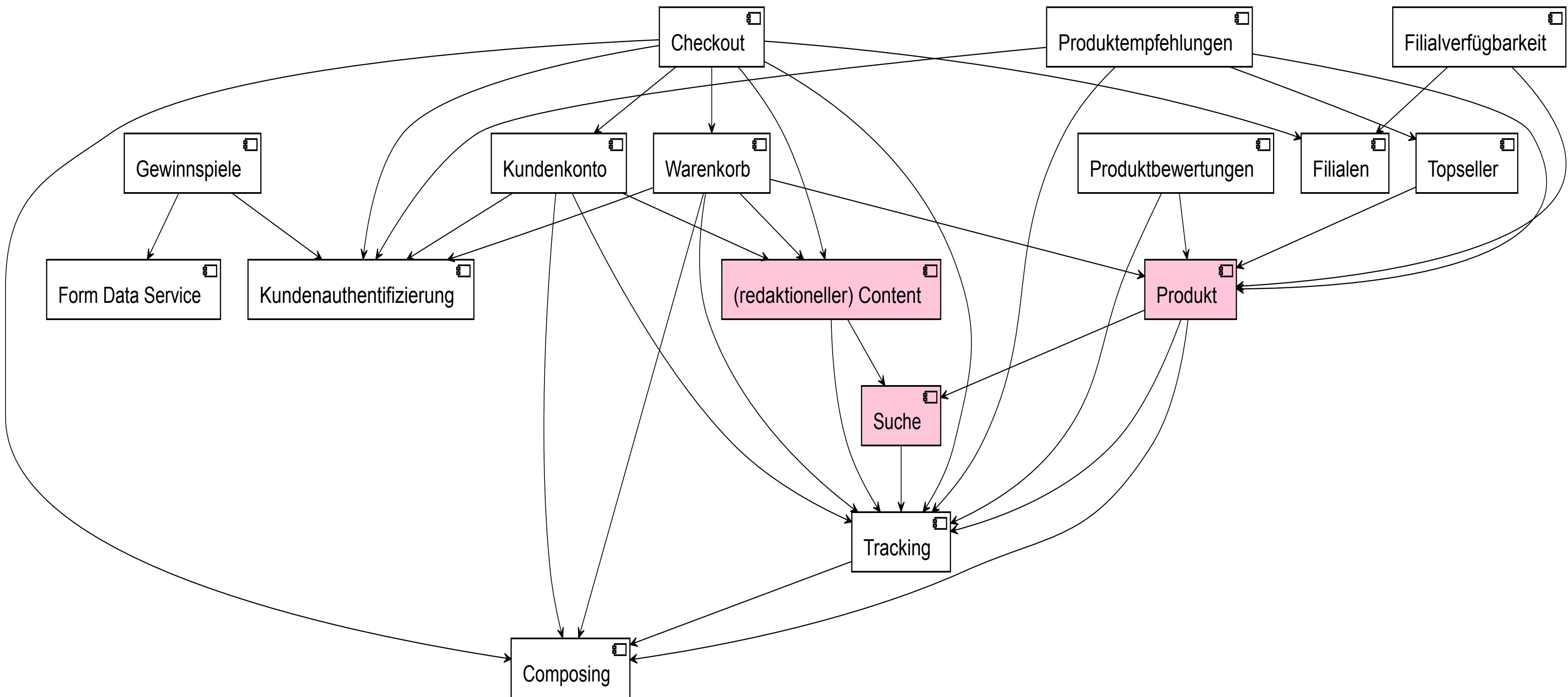


**< DEPENDENCY  
INVERSION />**

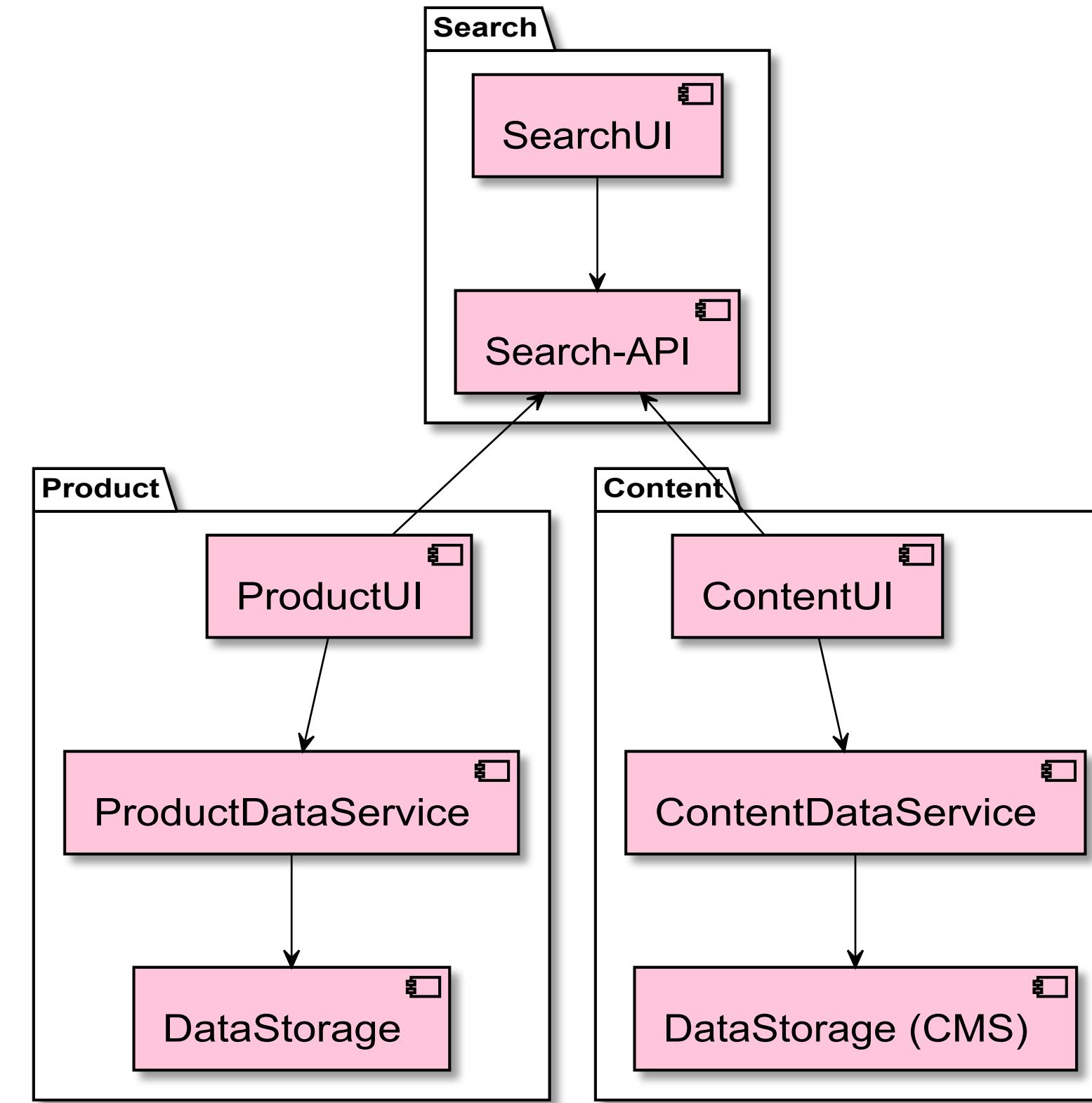
Allgemeine Module  
hängen nicht von  
speziellen Modulen  
ab.

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 (613) Beratung (221)

Sortieren Filtern

MARKE von dm MARKE von dm MARKE von dm

NEUES DESIGN



ONE SIZE  
Balea FUSS HORNHAUT ENTFERNER SOCKEN  
Feel Well  
Mint und Grüner Tee-Extrakt mit Aromatherapie-Duft  
befeiert von Hornhaut und mildert Schrunden

3,95 €

Balea Vital 5in1 Anti-Müdigkeits Augencreme

3,95 €

Balea Urea Fußcreme

1,25 €

Balea Körperöl Beauty-Öl

3,95 €

We setzte 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 €



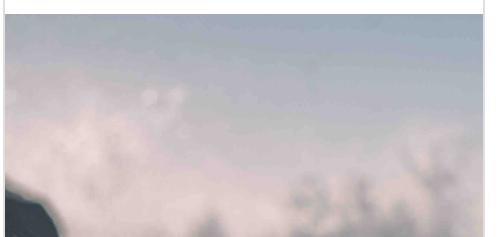
Lorem ipsum dolor sit amet

balea product 3  
8,65 €

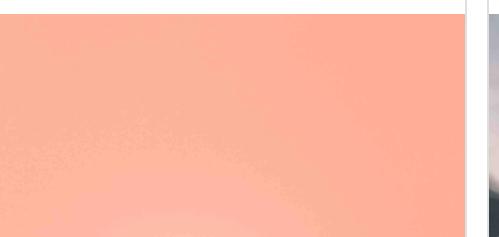


Lorem ipsum dolor sit amet

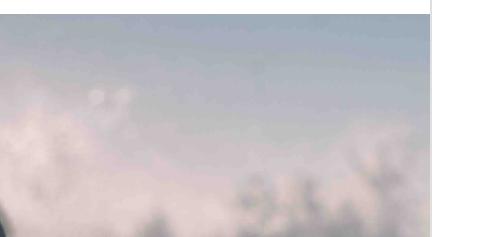
balea product 4  
2,95 €



balea product 5  
8,65 €



balea product 6  
2,95 €



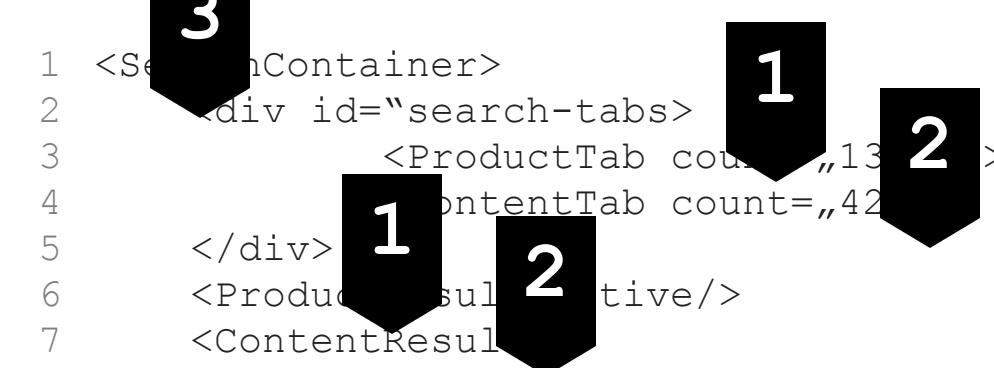
# Composition vs. Dependency Inversion

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

red yellow green code ~ comparison

composition is x

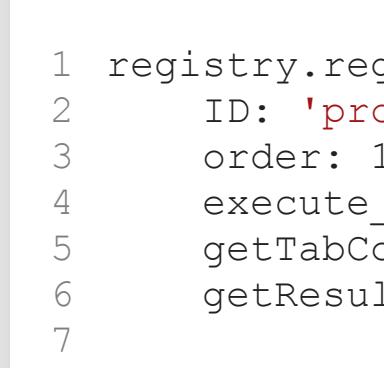
```
1 <SearchContainer>
2   <div id="search-tabs">
3     <ProductTab count="13">
4       <ContentTab count="42" />
5     </div> 1 2
6   <ProductResult active/>
7   <ContentResult />
8 </SearchContainer>
9
10 // --- everything in one repository ---
```



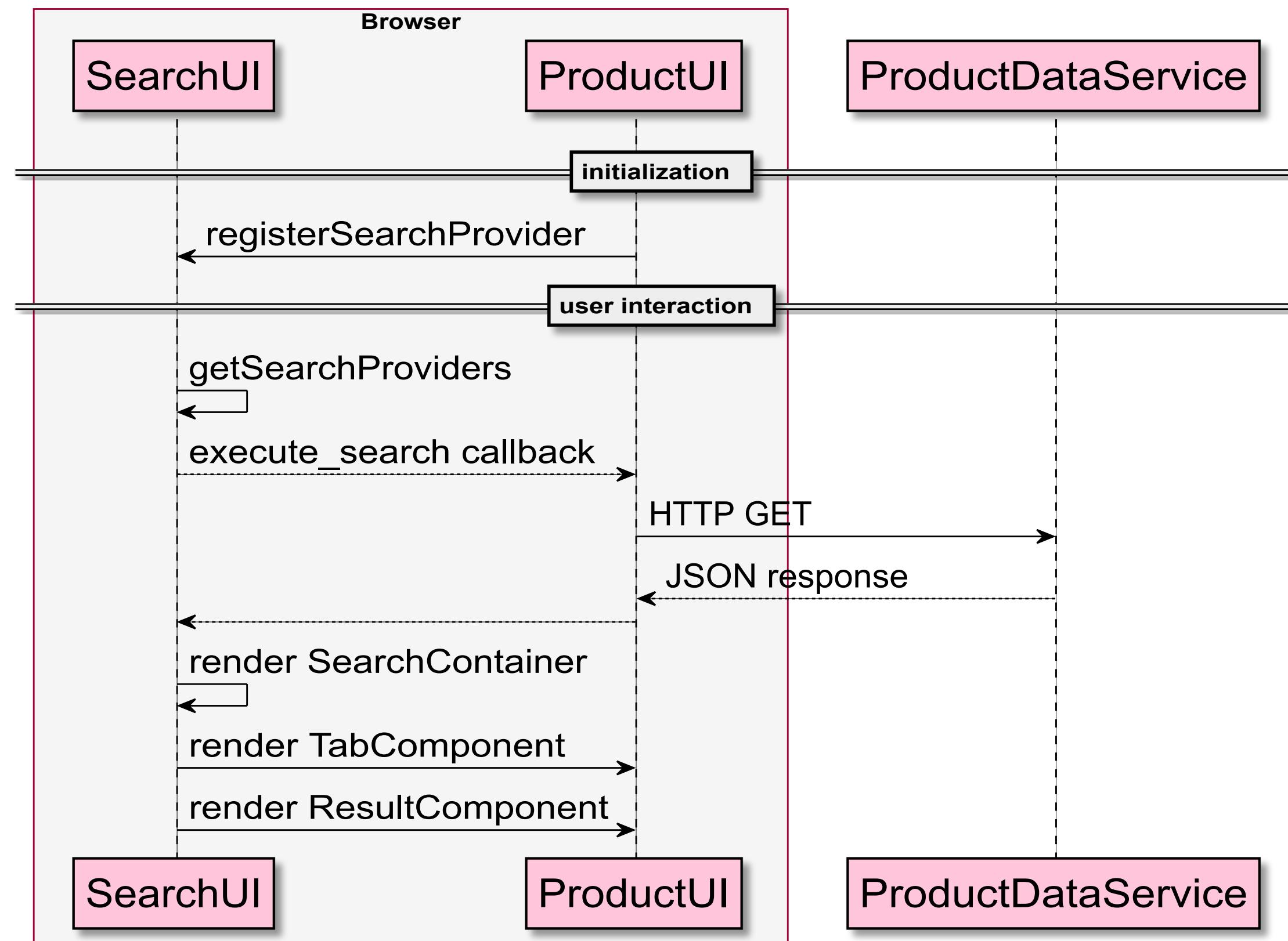
red yellow green code ~ comparison

dependencyInversion.js x

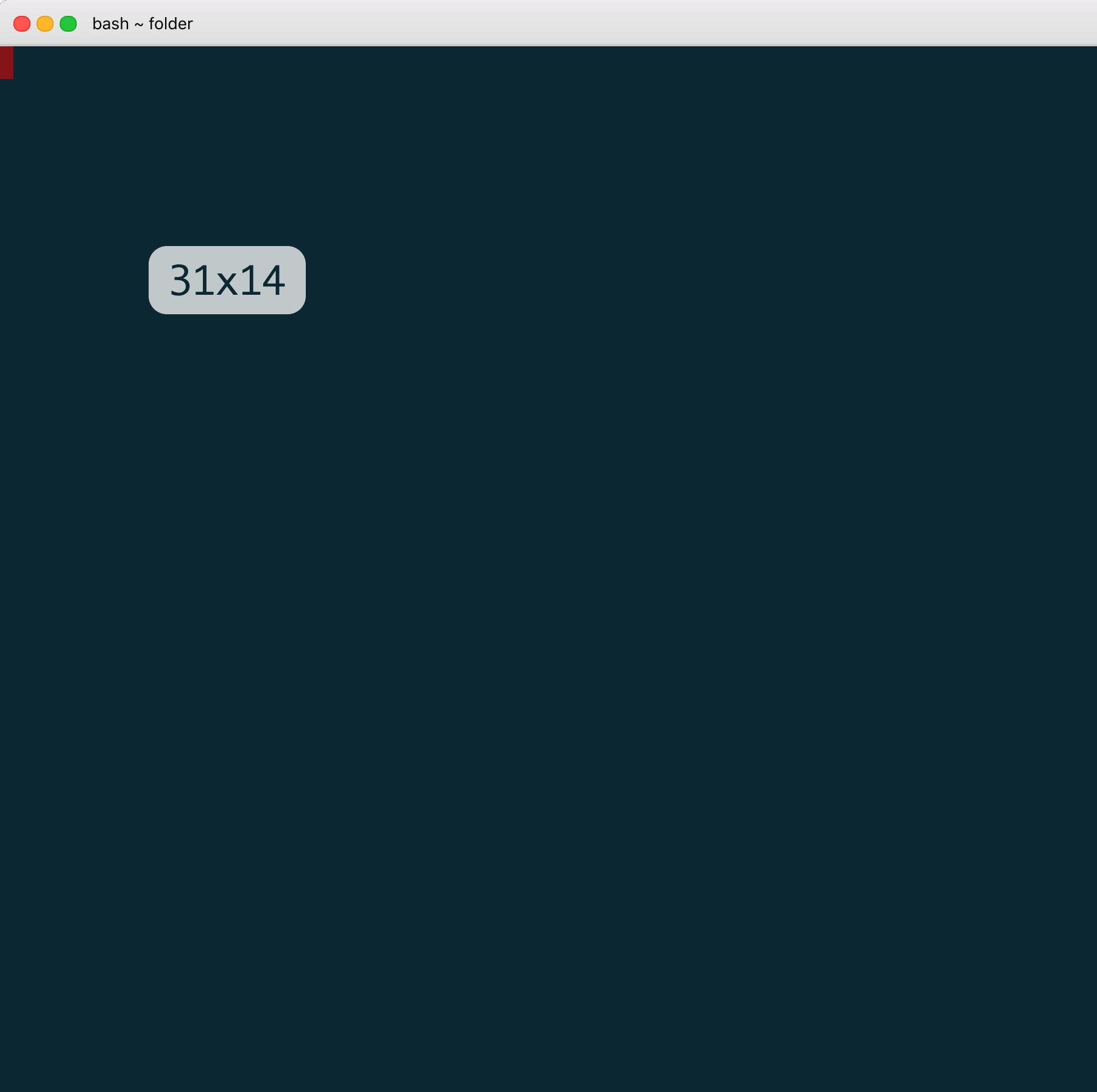
```
1 registry.registerSearchProvider({
2   ID: 'product',
3   order: 1,
4   execute_search: query => executeProductSearch(query),
5   getTabComponent: data => <ProductTab data={data} />,
6   getResultComponent: (query, data) => (
7     <ProductResult query={query} data={data} />
8   ),
9 });
10
11 // ----- ↑ 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

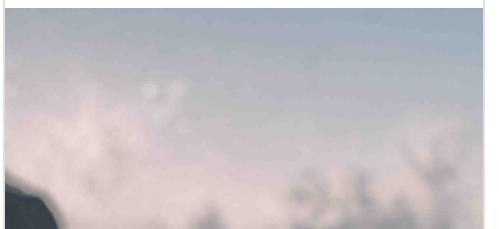
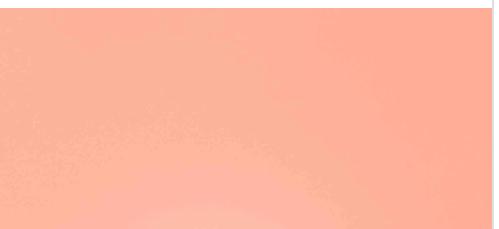
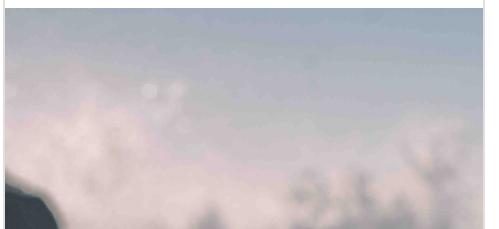


http://localhost:8080/?query=balea&searchType=product

## Suche nach "balea"

Produkte (6) Beratung (3)

Suche nach "balea": 6 counts

<b>balea product 1</b> 3,95 €  Lorem ipsum dolor sit amet	<b>balea product 2</b> 1,99 €  Lorem ipsum dolor sit amet	<b>balea product 3</b> 8,65 €  Lorem ipsum dolor sit amet
<b>balea product 4</b> 2,95 € 	<b>balea product 5</b> 8,65 € 	<b>balea product 6</b> 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...

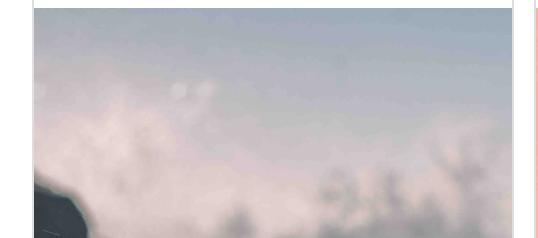
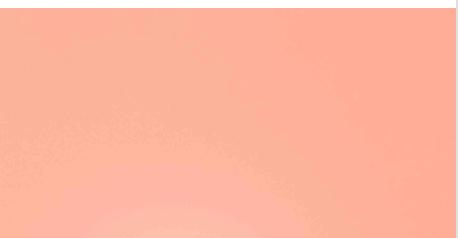
```
1 import React, { useEffect } from 'react';
2 import qs from 'qs';
3 import { getSearchProviders } from 'search-api';
4 import SearchResultHeader from './SearchResultHeader';
5 import SearchResultBody from './SearchResultBody';
6 import { doLoadCount, doLoadData } from './state/actions';
7 import 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';
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32   const searchProviders = getSearchProviders();
33
34   const activeSearchProviderFromSearchType = searchProviders.filter(
35     searchProvider => searchType && searchProvider.ID === searchType.toLowerCase()
```

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

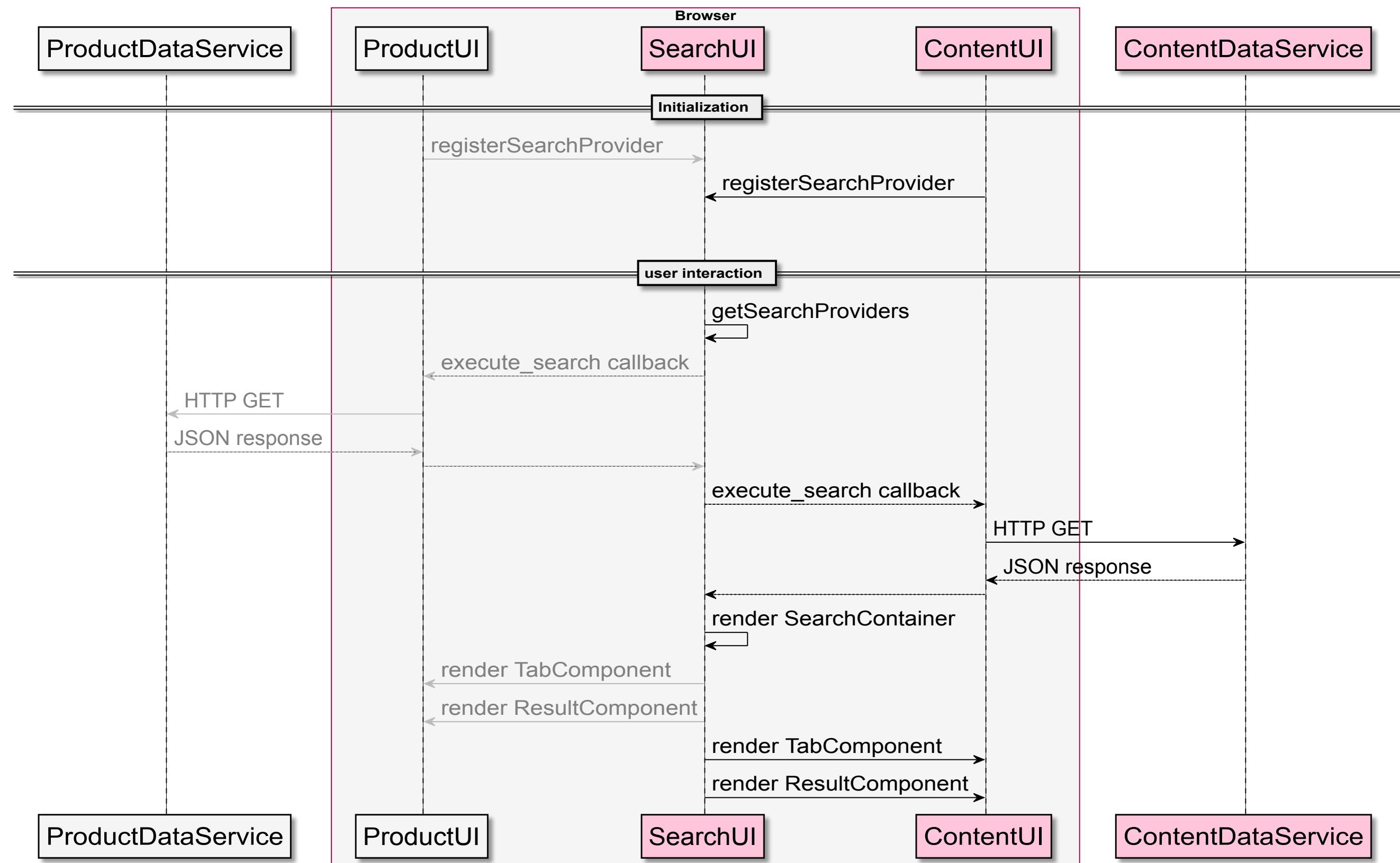
## Suche nach "balea"

Produkte (6) Beratung (3)

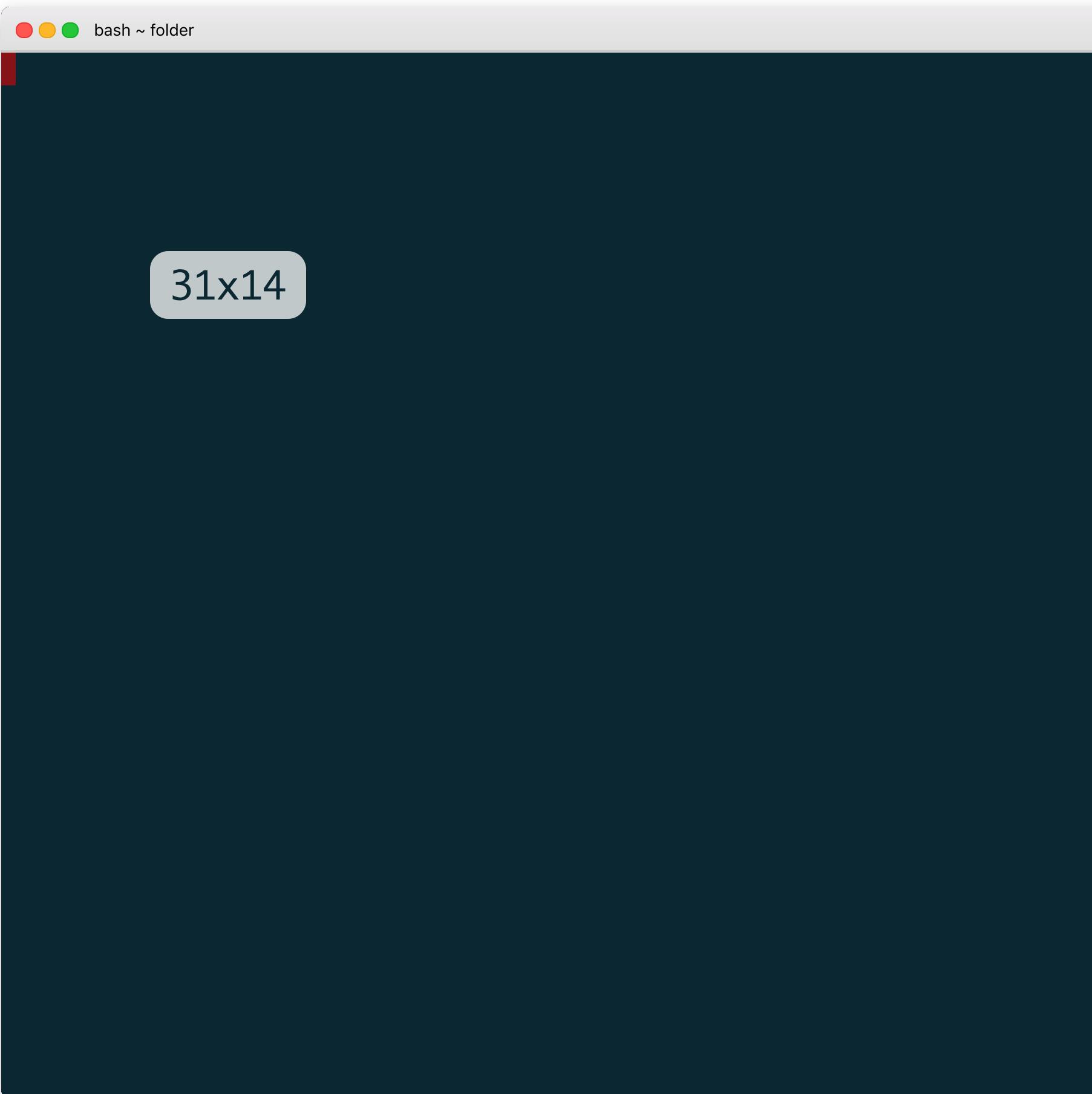
Suche nach "balea": 6 counts

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

## ... und jetzt noch mit Provider für Contentsuche



.. und jetzt noch mit Provider für Contentsuche

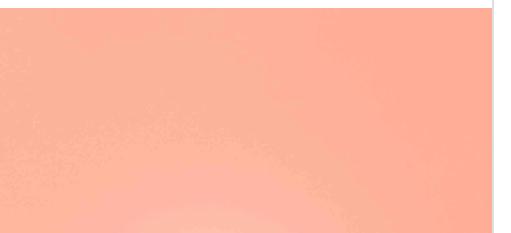


http://localhost:8080/?query=balea&searchType=product

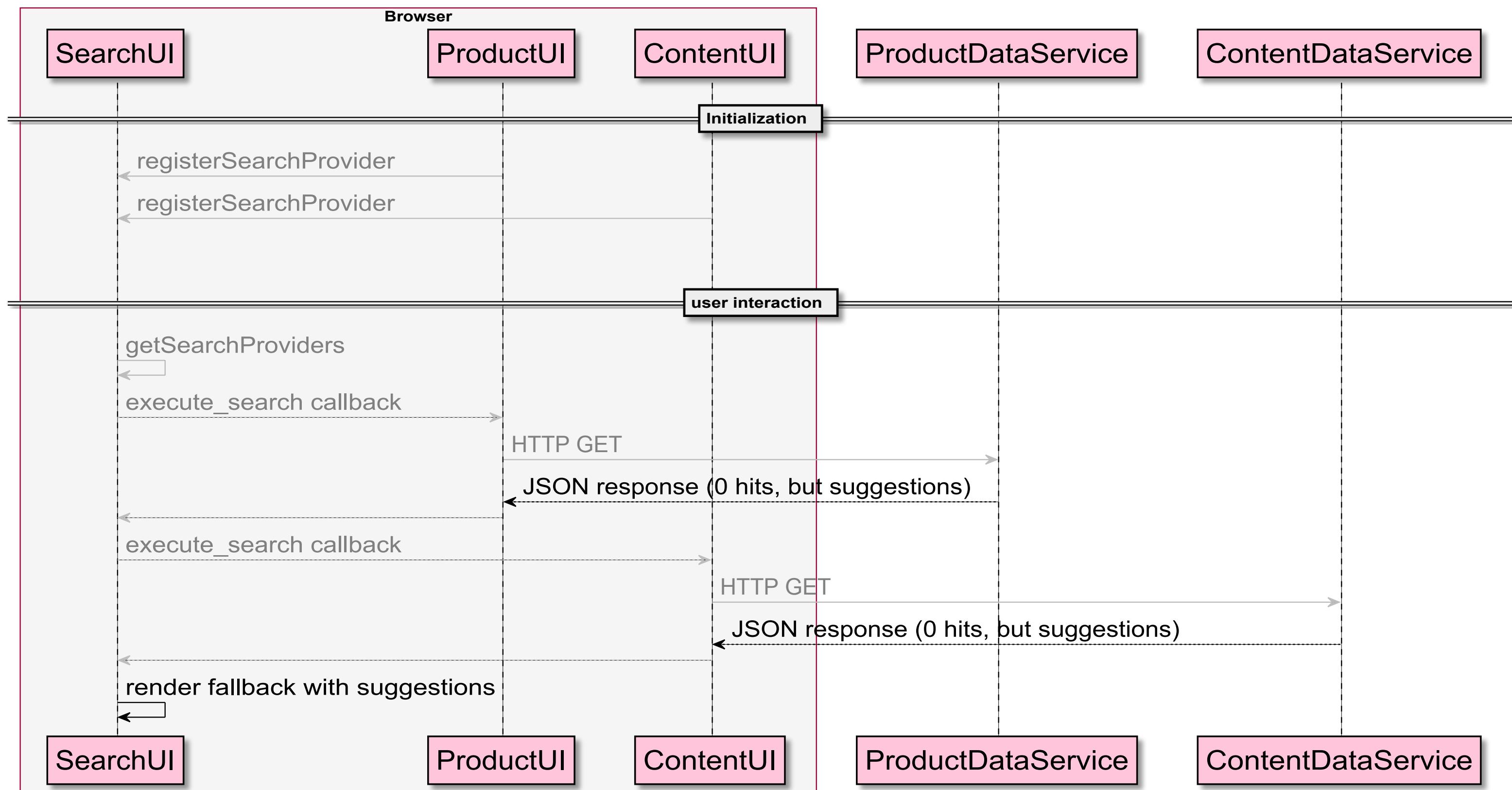
## Suche nach "balea"

Produkte (6) Beratung (3)

Suche nach "balea": 6 counts

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

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



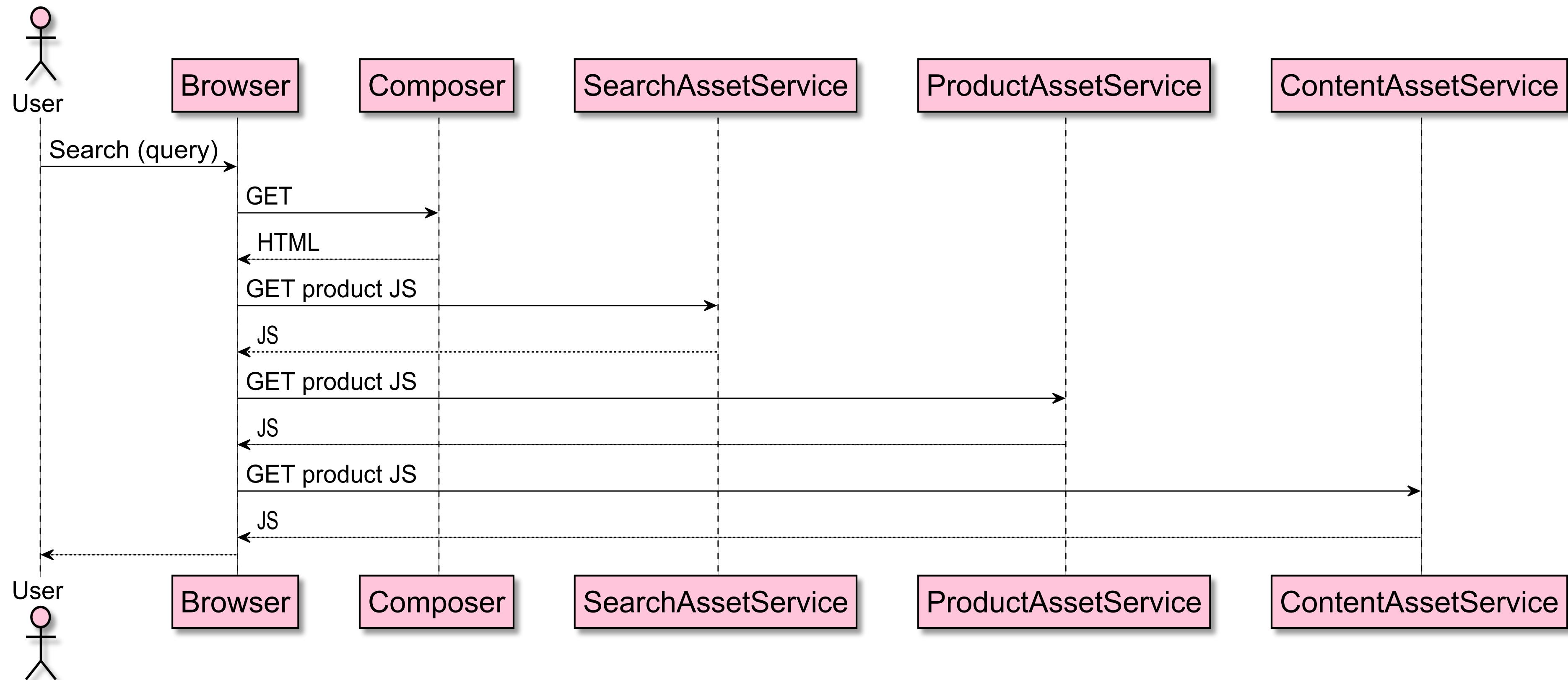
# Github Repo

---

<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

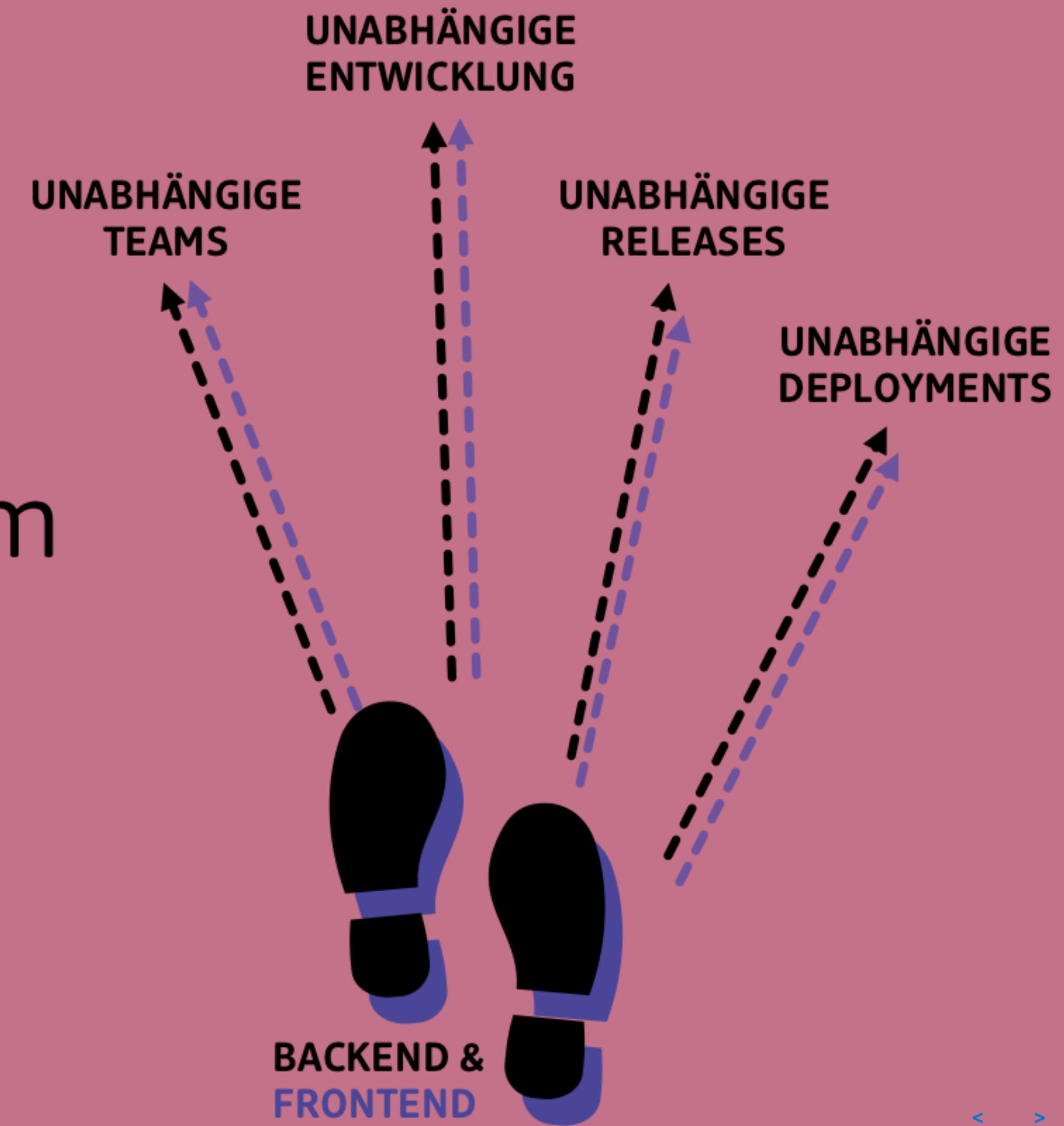


## **Dependency Inversion**

Unabhängiges Deployment

Runtime Composition

# Unabhängigkeit im Back- & Frontend





# Lessons Learned

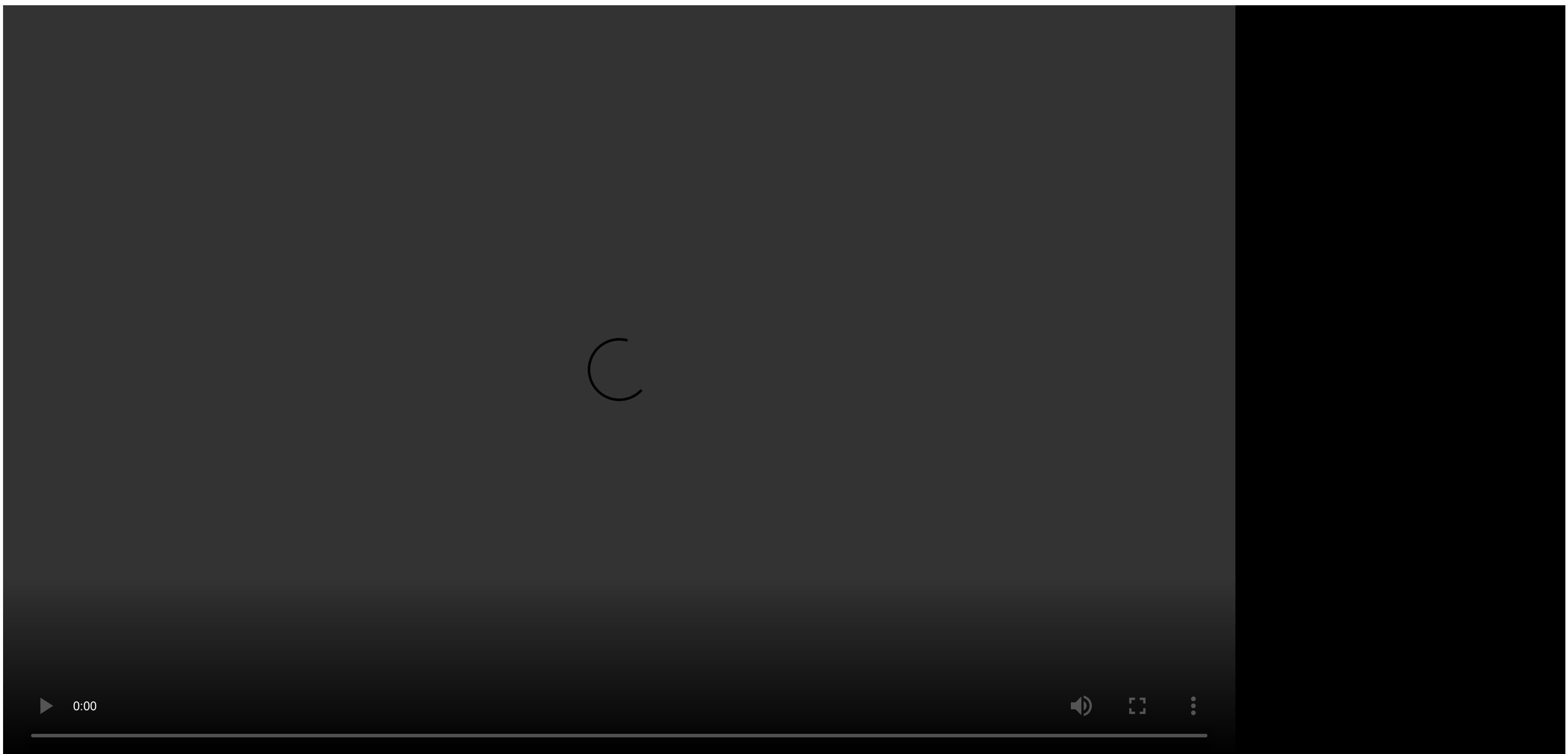
Vorteil umso größer, **je größer** das Projekt

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  
UIs von dm.de

DANKE!