

Opposites attract

...they say

Oliver Pehnke, eXXcellent solutions GmbH, Germany
July 9th/10th, 2020

ON AIR 
UI5con



Oliver Pehnke is a **Fullstack Software Architect**.

With a long history in **Java** (since 1.4) and **Javascript** based web applications.

In touch with **UI5** (since 1.2x) and SAP ABAP Backends some time ago.

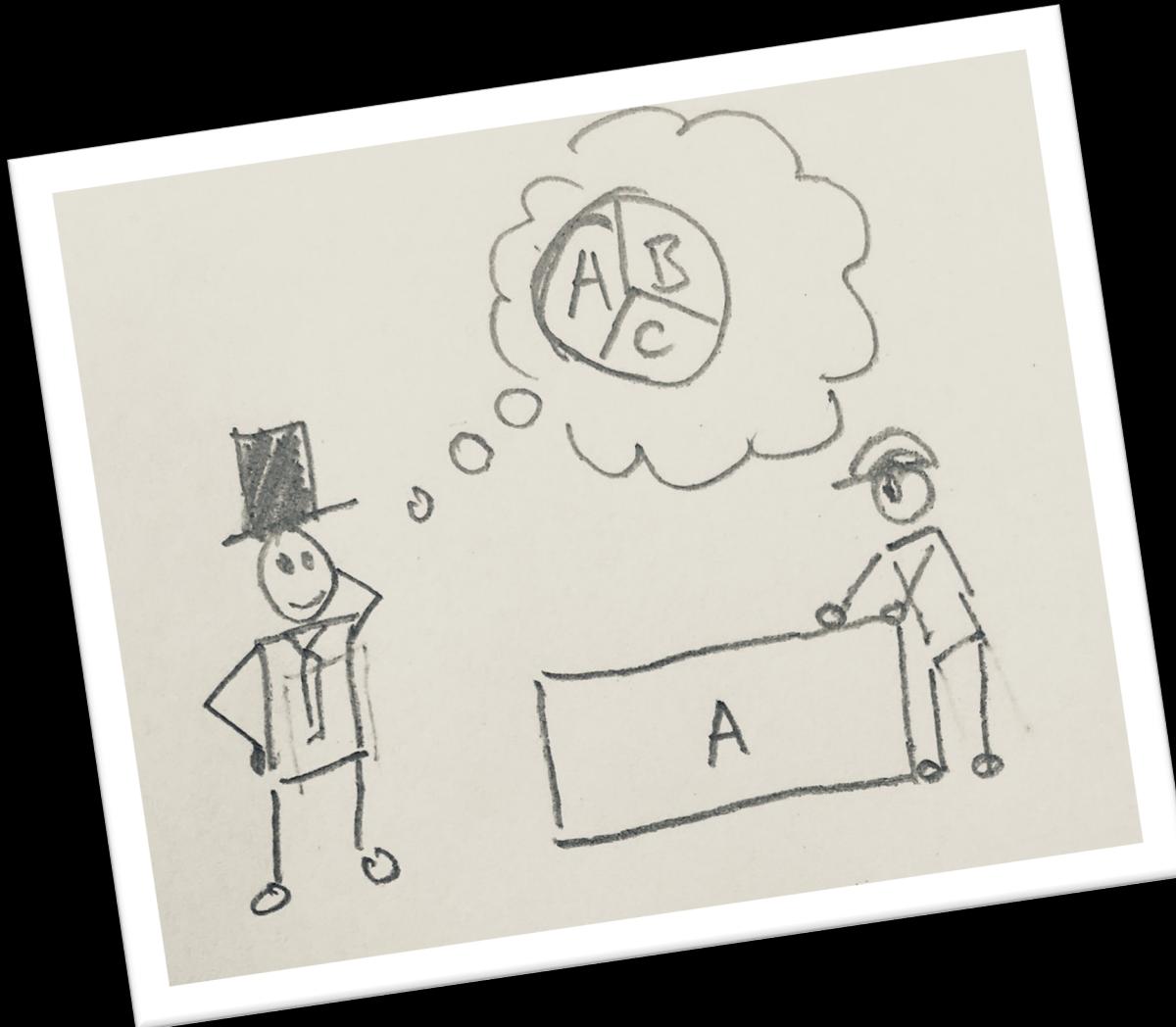
at eXXcellent solutions GmbH, Germany
www.excellent.de

The story so far

The Story so far

2010

„I want an integrated system“



The Story so far

2012

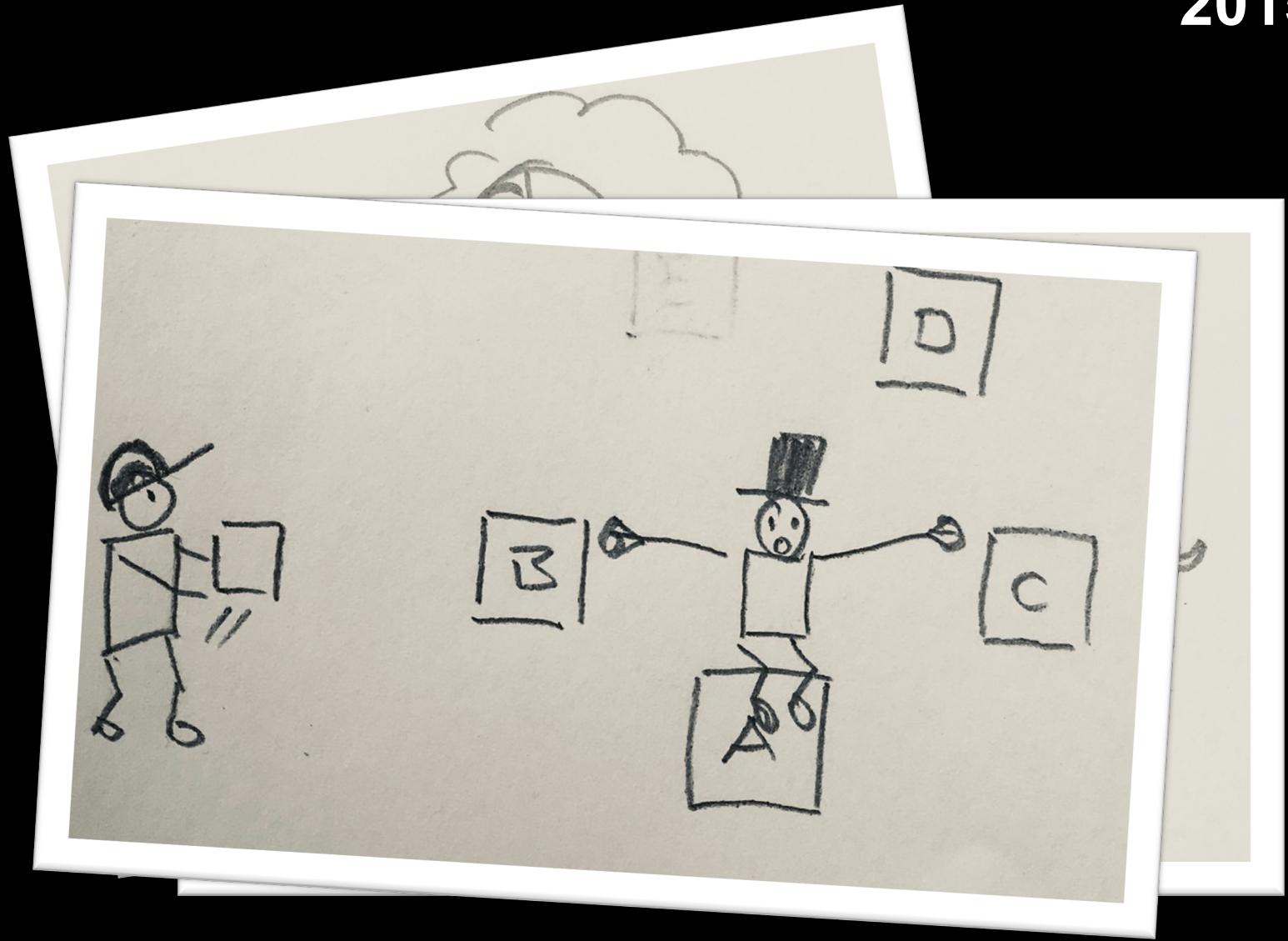
„Here is an integrated monolith“



The Story so far

2015

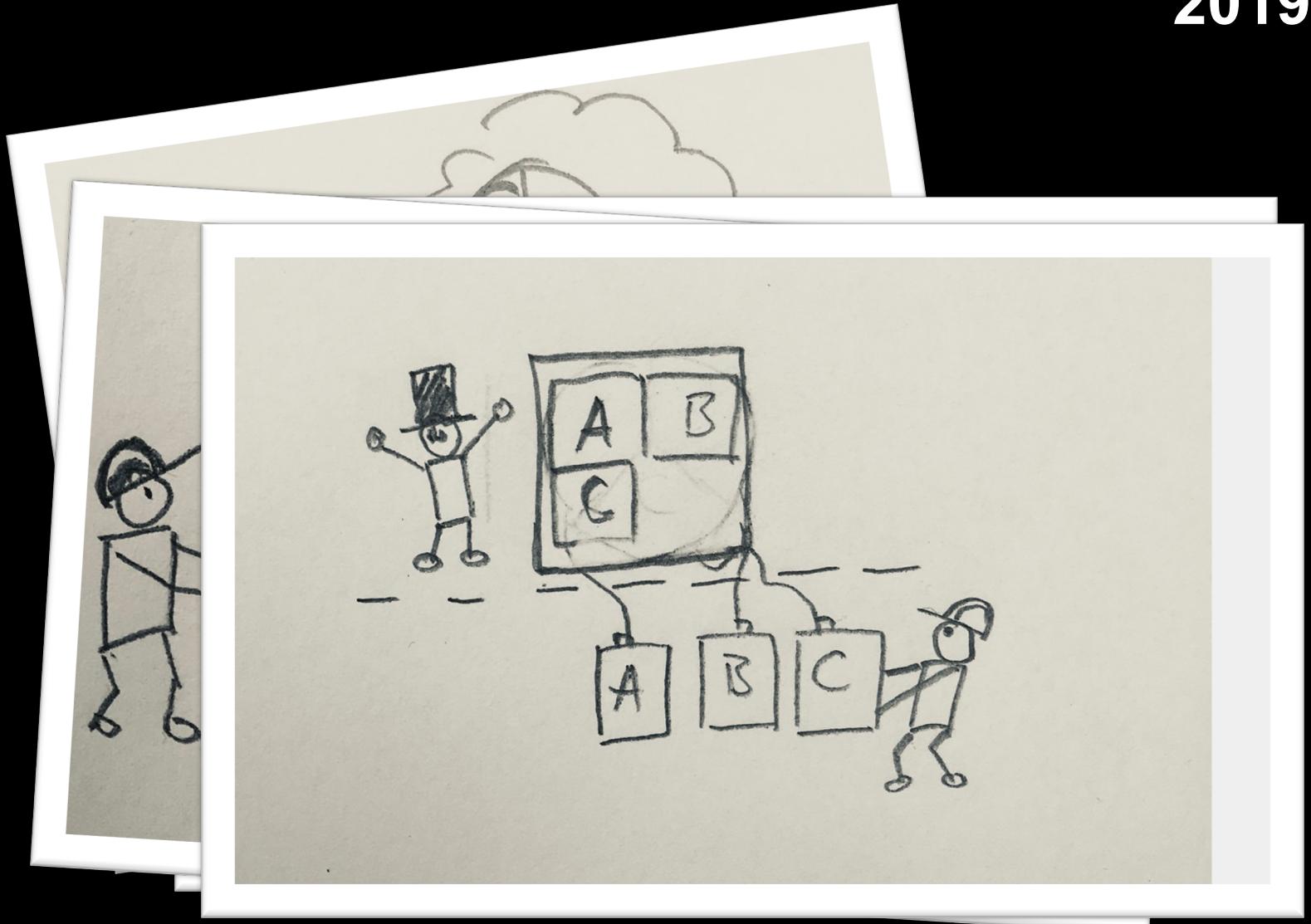
„Here is an event based
loosely coupled
integrated system
– so be careful“



The Story so far

2019

„Here is your shell“



Target picture

The screenshot shows a web browser window with the URL `test-dozenten[campus.de]/#/dashboard`. The page is titled "Campus". On the left, there is a sidebar with the following menu items:

- Campus Dashboard
- Module
- Foren
- Campus Links
- Online Klausuren
- Mein Profil
- Virtuelle Bibliothek
- Hilfe & Services

A red arrow points from the "Campus Links" item in the sidebar to the corresponding section on the main dashboard. The "Campus Links" section is highlighted with a red border. It contains the following text and links:

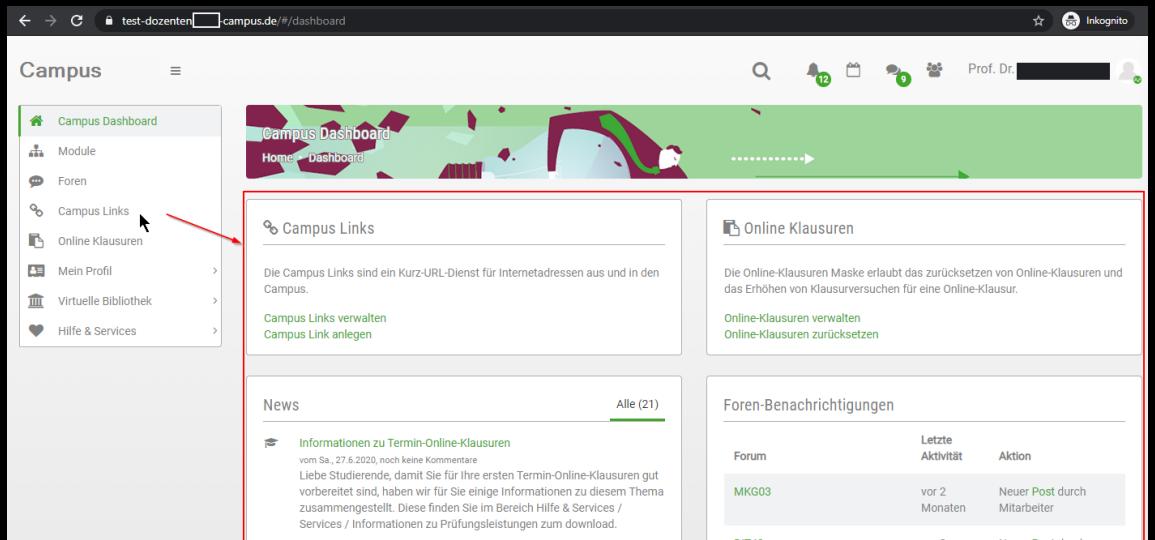
Die Campus Links sind ein Kurz-URL-Dienst für Internetadressen aus und in den Campus.

[Campus Links verwalten](#)
[Campus Link anlegen](#)

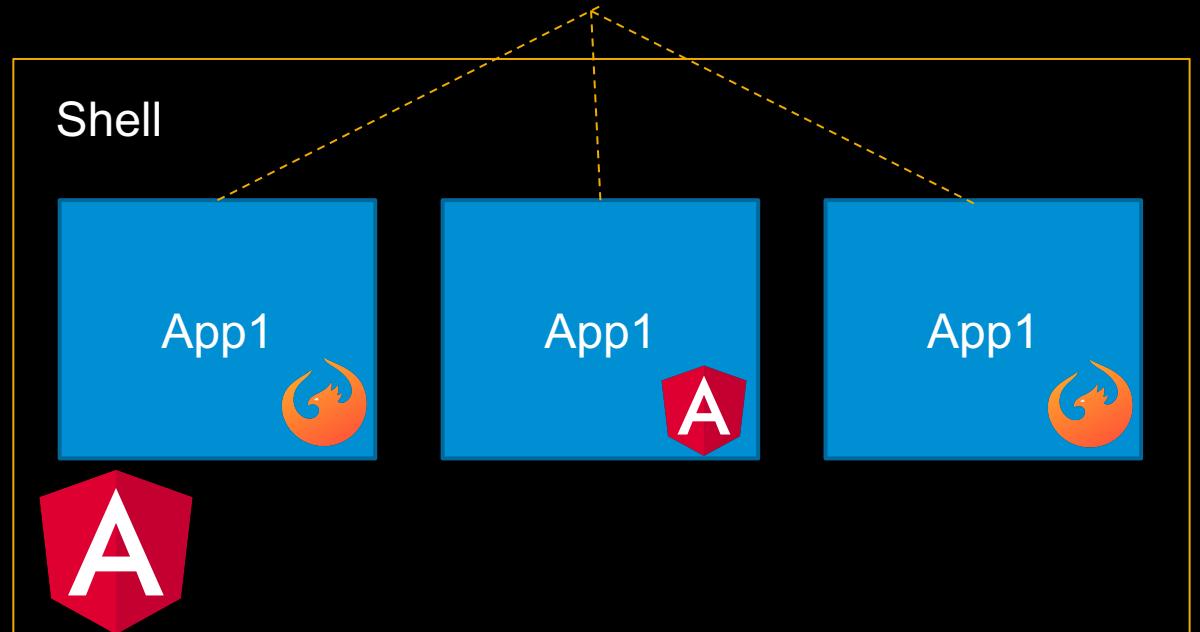
The main dashboard also features other sections: "Online Klausuren", "News", and "Foren-Benachrichtigungen". A large orange logo with a stylized letter "A" is visible on the left side of the dashboard area.

Target picture

Seamless integrated view



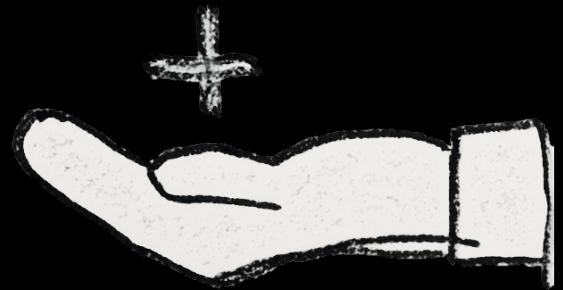
SPAs for macro architecture



Promises

- Integrated
 - Seamless integration of different web applications
 - Lifecycle per application
- Use advantages of different frameworks
 - Special features
 - Libraries
 - Styling

„Micro Frontend“



Opposites ?

Angular

- Best practise solution, perfect match for complex apps
- Needs advanced web app knowledge (JavaScript ES6+, TypeScript, Reactive/Observables, HTML, CSS & Devop topics)
- But:
 - often Know-How overload (rollout, performance, Styling, debugging)
 - often misused concepts like RxJs



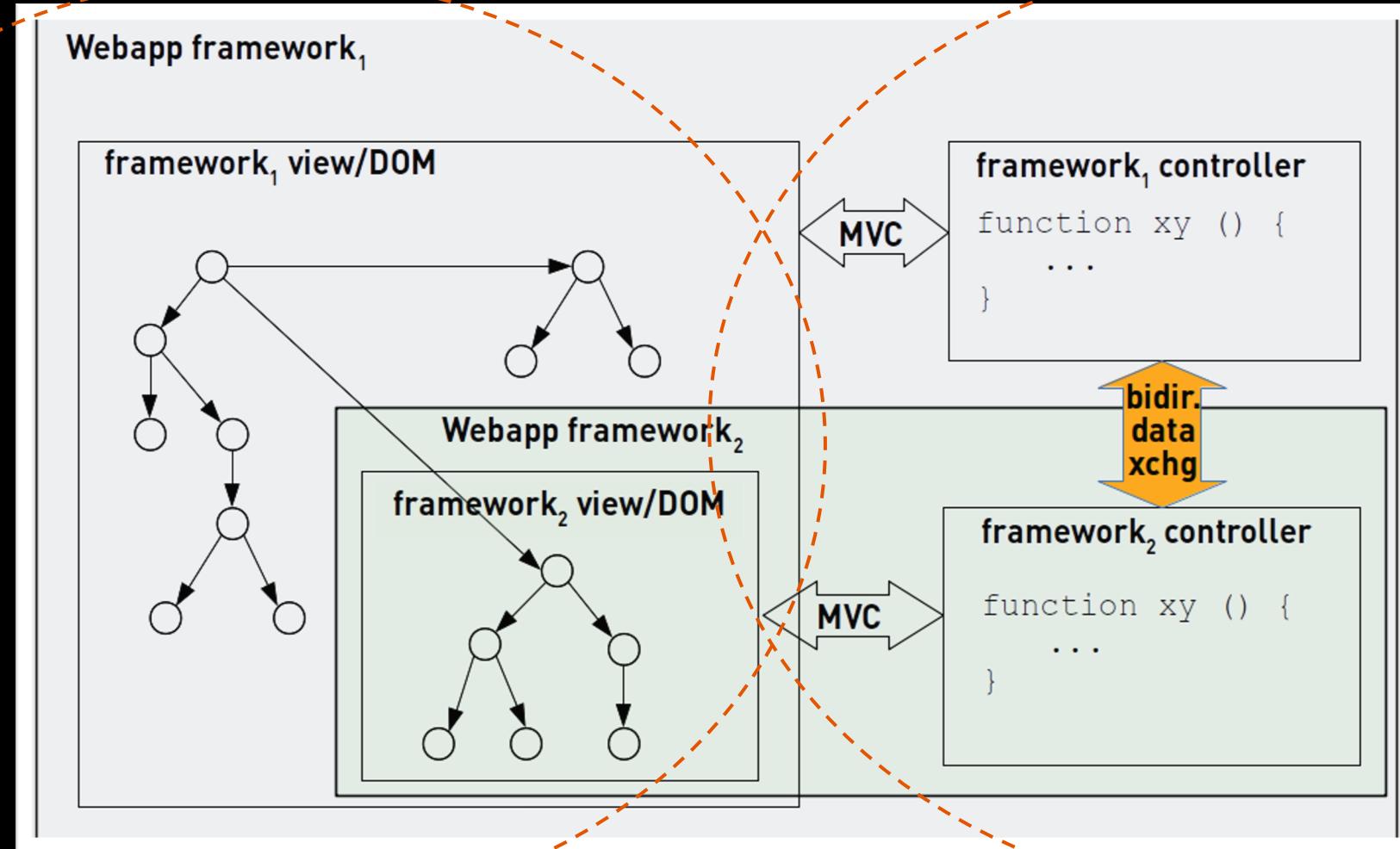
UI5

- One stop solution with UI controls following Fiori UX Guidelines
- Needs basic web app knowledge (JavaScript ES5, async promises, XML)
- But:
 - often unused concepts (e.g. 5000 LOC controllers)
 - often „good enough solutions“ with a broken window effect

Mark, set, go!

Architecture of this approach – What we want

visual
integration



Bootstrapping of web applications – e.g. UI5

- Runtime environment typically referenced by <script>-tags in index.html

```
<script  
  id="sap-ui-bootstrap"  
  src="https://openui5.hana.ondemand.com/resources/sap-ui-core.js"  
  ...  
</script>
```

- Definition of "special" root HTML element in index.html

```
<div data-sap-ui-component ...></div>
```

- onload event typically triggers bootstrapping & rendering of application

Angular in UI5

Integration of Angular in UI5 (I) - Requirements

UI5 Controller

Angular Component

- Angular runtime + the application further bundles required
 - polyfills-es2015.js
 - polyfills-es5.js
- Dynamically append <script> tags with required sources to UI5 view with default JS means

```
Controller.extend(...)  
...  
init: function()  
let scriptElement = document.createElement("script");  
scriptElement.src = that.dir + "/" + source.name;  
scriptElement.type = "module";  
scriptElement.onload = resolve;  
...  
document.head.appendChild(scriptElement);  
...
```

Integration of Angular in UI5 (II) – UI5 hook

- UI5 view contains plain HTML widget

```
...  
<core:HTML id="angularDiv" />  
...
```

UI5 Controller

Angular Component

- Root anchor for the Angular web application is set programmatically

```
...  
let htmlDiv = this.byId("angularDiv");  
htmlDiv.setDOMContent(  
    "<div style='height:100%; width:100%'><app-root></app-root></div>"  
)  
...
```

Integration of Angular in UI5 (III) – Communication

- Provide communication channel by exposing UI5 event bus via Window object

UI5 Controller

Angular Component

```
...  
window.ui5EventBus = sap.ui.getCore().getEventBus();  
...
```

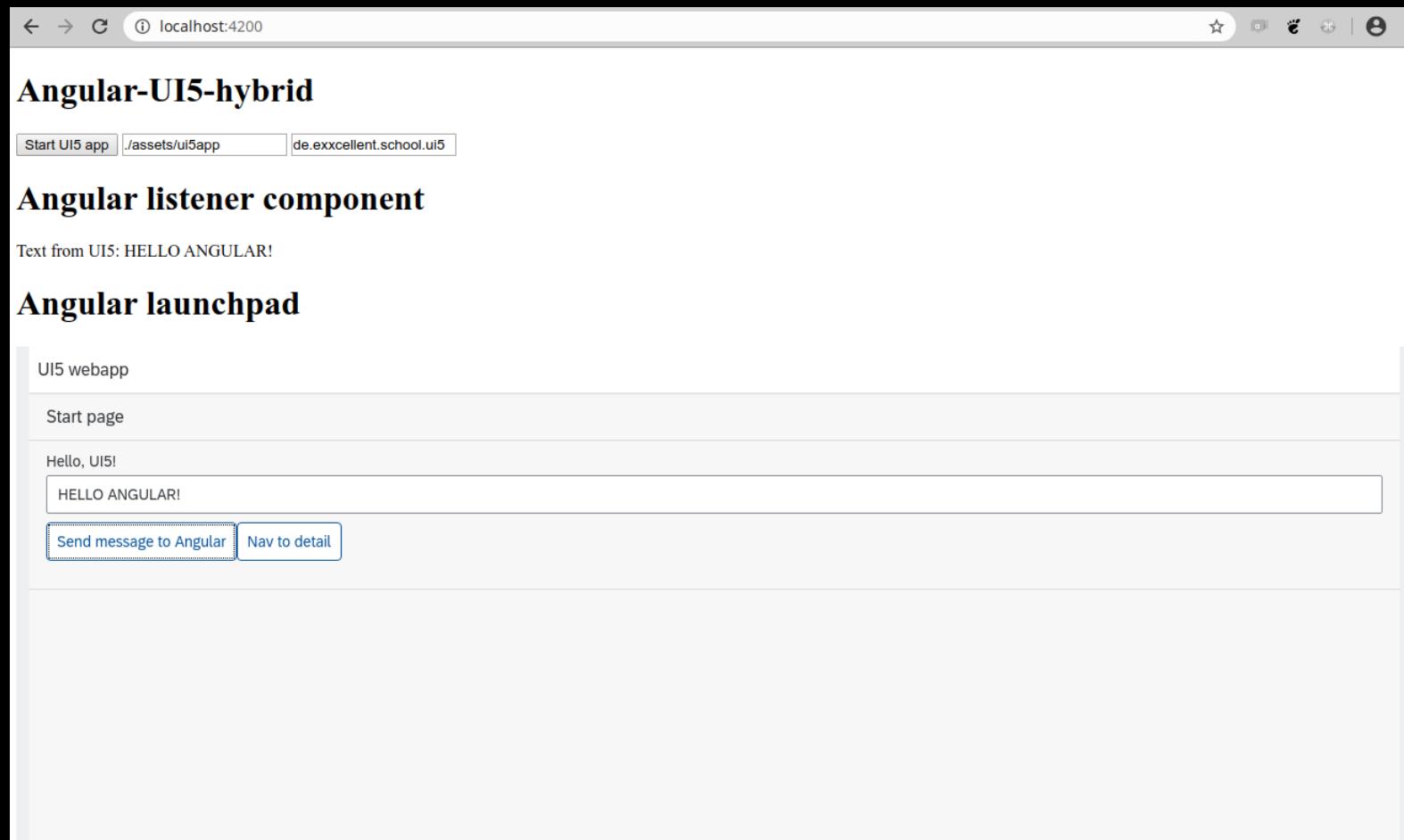
- UI5 event bus then can be consumed by the Angular application by subscribing to channel

```
...  
window.ui5EventBus.subscribe('Channel', 'Event',  
    (channel, event, data) => {  
        this.eventText = data.text;  
        ...  
    }  
);  
...
```

Angular

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Integration of Angular in UI5 (IV) - Demo



UI5 Controller

Angular Component

UI5 in Angular

Integration of UI5 in Angular (I) – Status Quo

- UI5 already provides tooling for hosting UI5 web applications
 - Create components dynamically → `sap.ui.getCore().createComponent`
 - Host component in a UI5 web application → `sap.ui.core.ComponentContainer`
- Utilize UI5 tooling by implementing a "bridge" component for Angular
 - Include UI5 runtime environment via Angular Renderer2 instance

```
...
const ui5Script = this.renderer.createElement('script');
this.renderer.setProperty(ui5Script, 'id', 'sap-ui-bootstrap');
this.renderer.setProperty(ui5Script, 'src',
  'https://openui5.hana.ondemand.com/resources/sap-ui-core.js');
this.renderer.setAttribute(ui5Script, 'data-sap-ui-libs', 'sap.m');
this.renderer.setAttribute(ui5Script, 'data-sap-ui-async', 'true');
this.renderer.setAttribute(ui5Script, 'data-sap-ui-theme', 'sap_fiori_3');
...
this.renderer.appendChild(document.body, ui5Script);
...
```

Angular Component

UI5 Component
Container

Integration of UI5 in Angular (II) – Angular UI5 starter



- Once the UI5 runtime environment is loaded, UI5 widgets can be used in the Angular web application

```
...
const oCore = sap.ui.getCore();
...
oCore.attachInit(() => {
    const componentContainer = new sap.ui.core.ComponentContainer(...);
    componentContainer.placeAt(this.ui5Content.nativeElement);
    ...
}) ;
...
```

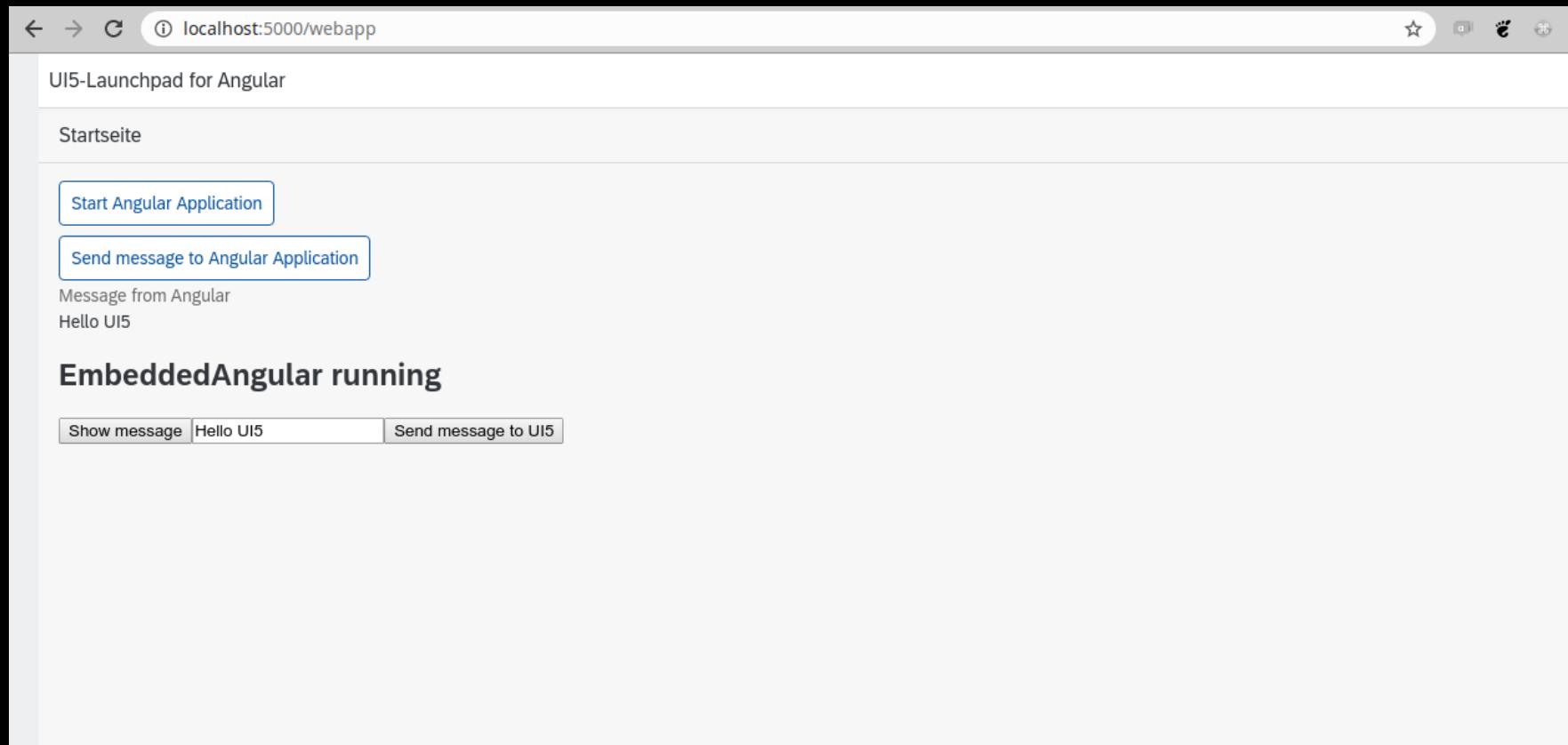
Integration of UI5 in Angular (III) – Communication API at ease

- The Angular component can be attached to the UI5 event bus

```
...
const eventBus = oCore.getEventBus();
...
eventBus.subscribe('UI5Launchpad', 'ui5ToAngular',
(channel, eventId, data) => {
    this.eventBus.publish('comm', data);
});
...
...
```



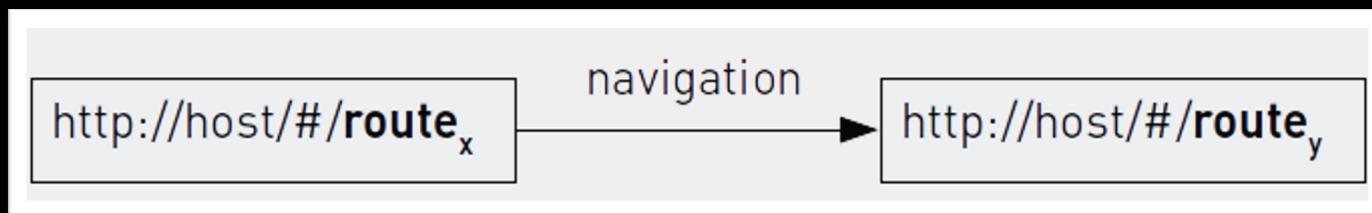
Integration of UI5 in Angular (IV) - Demo



Angular Component
UI5 Component Container

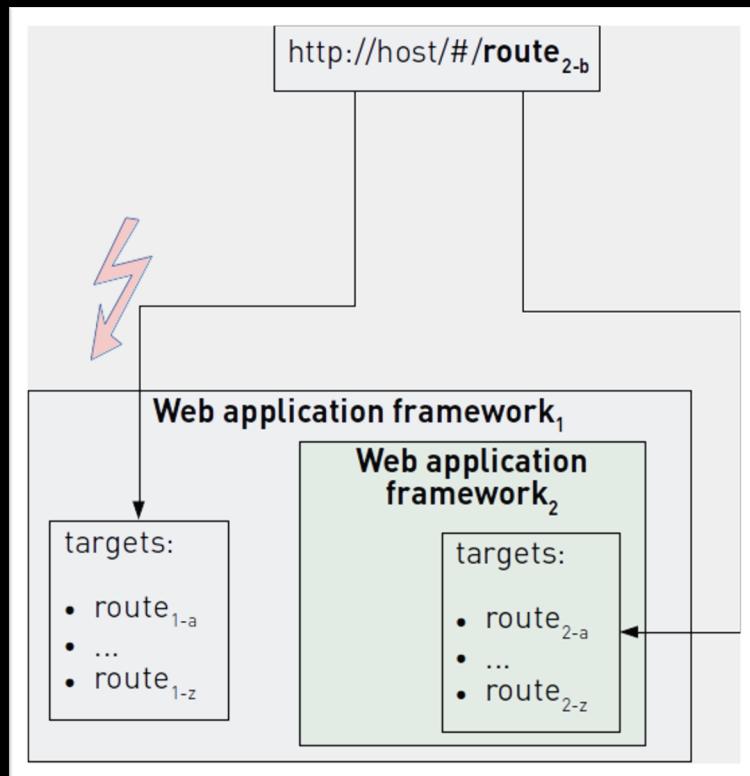
Routing in nested applications (I) – Status Quo

- Hosting and nested web application both use their own router
- Basically a listener on changes in location URLs
- Usually default i.e. hash based operation mode
 - Splits URL by "#"
 - Token after "#" used as key for content change in web application
 - Navigation essentially done by hash change

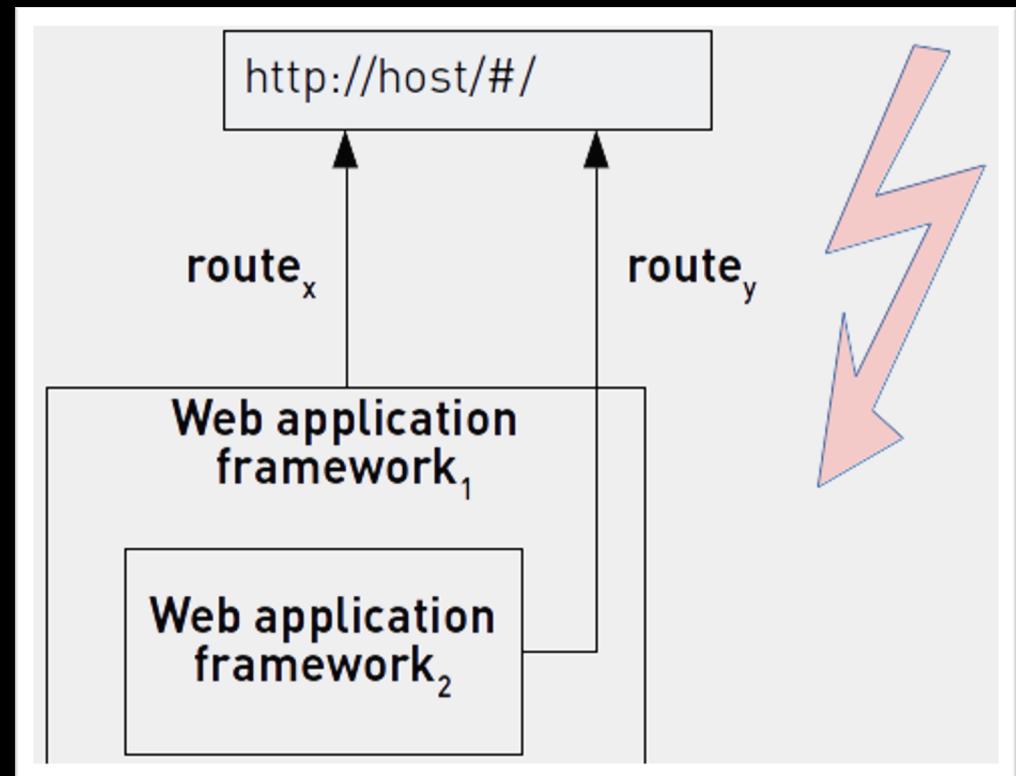


Routing in nested applications (II) – Challenges

– Invalid hashes

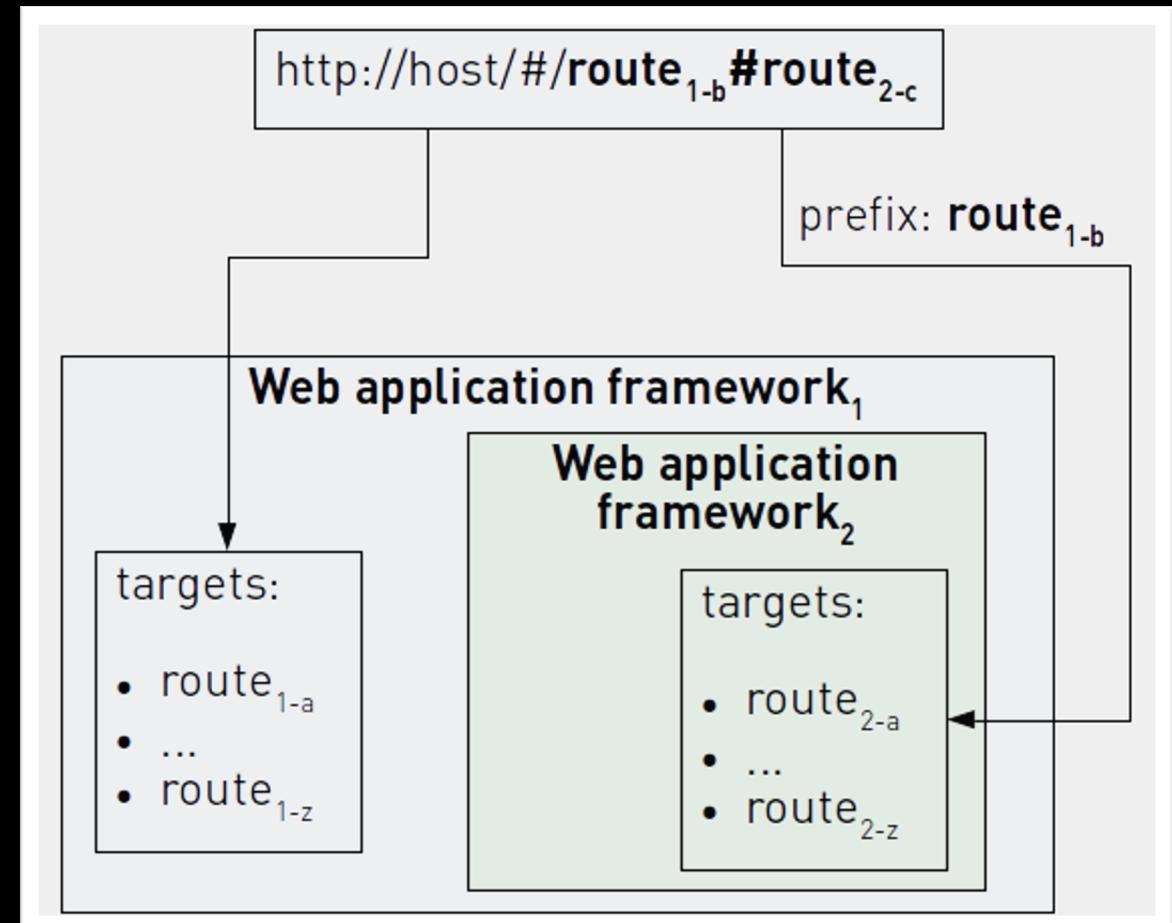
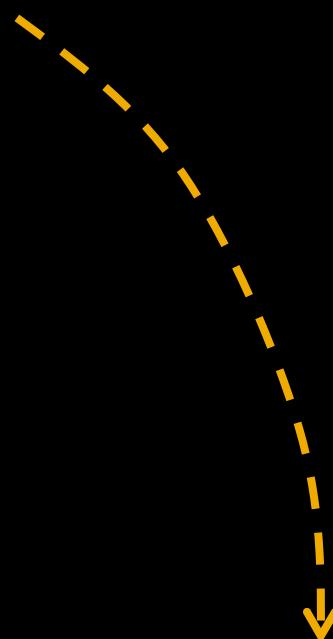


- Conflicting "race conditions" of hash changers



Routing in nested applications (III) – Possible Solution

- Solution: combined hashes with a "PrefixedRouter"
 - Subclass of `sap.m.Router`
 - Overwrites method `parse`
 - Contains a prefix which is ignored for route matching



<https://www.excellent.de/tech-diary/2020/04/30/Routing%20in%20UI5-Angular%20hybrids/>

Heureka

To App

From App

The screenshot shows the Heureka application interface. On the left, there is a sidebar with icons for home, campus, messages, calendar, help, and a heart. The main area displays a list of 'Onlineklausuren' (11) for user 'bertha'. Each item in the list includes the participant's name ('bertha.bachelor'), status ('Gestartet'), and exam code ('EVW02-OK'). A blue arrow points from the 'Online-Klausur Status' column in the list to the 'Klausur Status' section in the detailed view. Another blue arrow points from the 'Online-Klausur' section in the list to the 'Online-Klausur' section in the detailed view. An orange arrow points from the 'Online-Klausuren' list to the 'Online-Klausur Journal' section. A red arrow points from the 'Online-Klausuren' list to the 'Online-Klausur' section. A red icon with a white letter 'A' is located in the bottom-left corner of the list area. A large orange flame icon is located in the bottom-right corner of the detailed view area.

Nicht sicher | int4.dev.excellent.de:4500/#/ui5/onlineexams

Campus

Onlineklausuren (11)

bertha

Teilnehmer Klausur Status Online-Klausu...

Proctor Termin: 8.5.2020

bertha.bachelor Gestartet EVW02-OK >

Proctor Termin: 23.4.2020

bertha.bachelor Gestartet UFU52-OK >

bertha.bachelor Gestartet EIT01-OK >

Proctor Termin: 19.4.2020

bertha.bachelor Gestartet ENC11-OK >

Proctor Termin: 15.4.2020

bertha.bachelor Gestartet DGL11-OK >

bertha.bachelor Gestartet MKG20-OK >

Proctor Termin: 9.4.2020

bertha.bachelor Gestartet EVW02-OK >

Proctor Termin: 27.11.2019

Generelles

Teilnehmer: bertha.bachelor
Matrikelnummer: 579732
Online-Klausur: EVW02-OK
Baustein:
Präsenz-Klausur: EVW02P
Baustein:
Produkt: BABW1S
Mögliche Klausurvorschüsse: 2
Begründung für Versuchserhöhung:

Online-Klausur

Klausur Status: Gestartet
Nicht erschienen:
Proctor Termin: 08.05.2020, 20:39:23
Benoteter Versuch:
Anteil Freitext: über 35%
Kommentar für Zurücksetzung des Versuchs:

Online-Klausur Journal

Klausur Status

Gestartet

Benoteter Versuch:

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Summary

- Multi framework "launchpad" / shell
 - Seamless visual integration of web application across framework works,
 - but use similar stylesheets!
 - Interaction integration possible via events,
 - but application must use them „wise“
 - Interaction integratrn via hyperlinks with almost no effort
- UI5 single purpose apps match Angular custom shell very well
 - Cost reduction for administrative apps with UI5
 - Reuse of whole apps as ui5 components easy
 - Angular perfect for custom tailored shell
- Shell / Portal solution
 - easy today using W3C standards



Outlook

- **WebComponents?**
 - Yes, for „shared widgets“ across apps
- **Micro-Service / -Frontend Application Architecture?**
 - Changes development paradigm -> less complex, own app lifecycle
 - Cost Reduction -> reduced scope
- **Web = semantic content not styled content**

Do opposites attract?

- Yes, but they don't say how long...

Oliver Pehnke

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<https://www.exxcellent.de/tech-diary/2020/03/18/Angular-UI5-hybrid%20application/>
<https://www.exxcellent.de/tech-diary/2020/04/30/Routing%20in%20UI5-Angular%20hybrids/>

Special thanks to Dr. Patrick Schmidt for putting it all together

