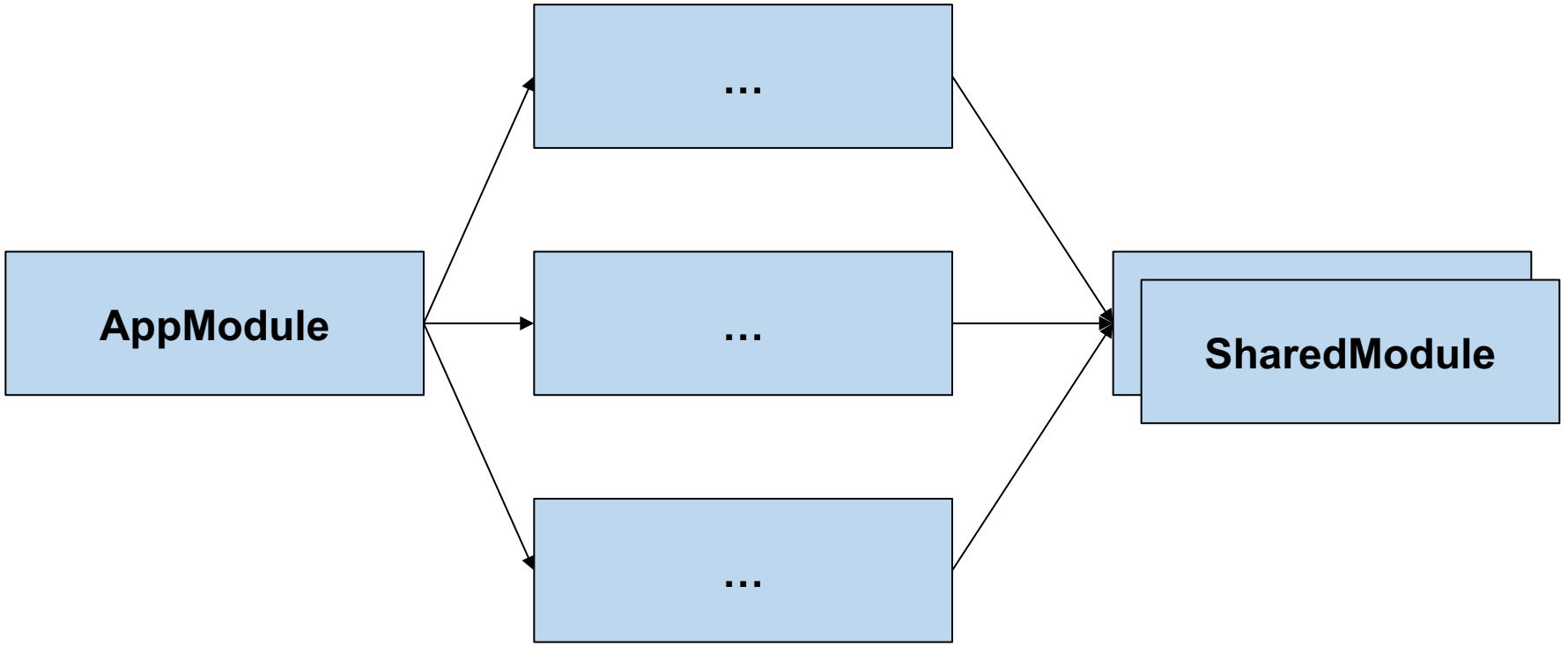
ANGULAR
ARCHITECTS
INSIDE KNOWLEDGE

Architecture for Angular Enterprise Applications

Alex Thalhammer

Typical Module Structure



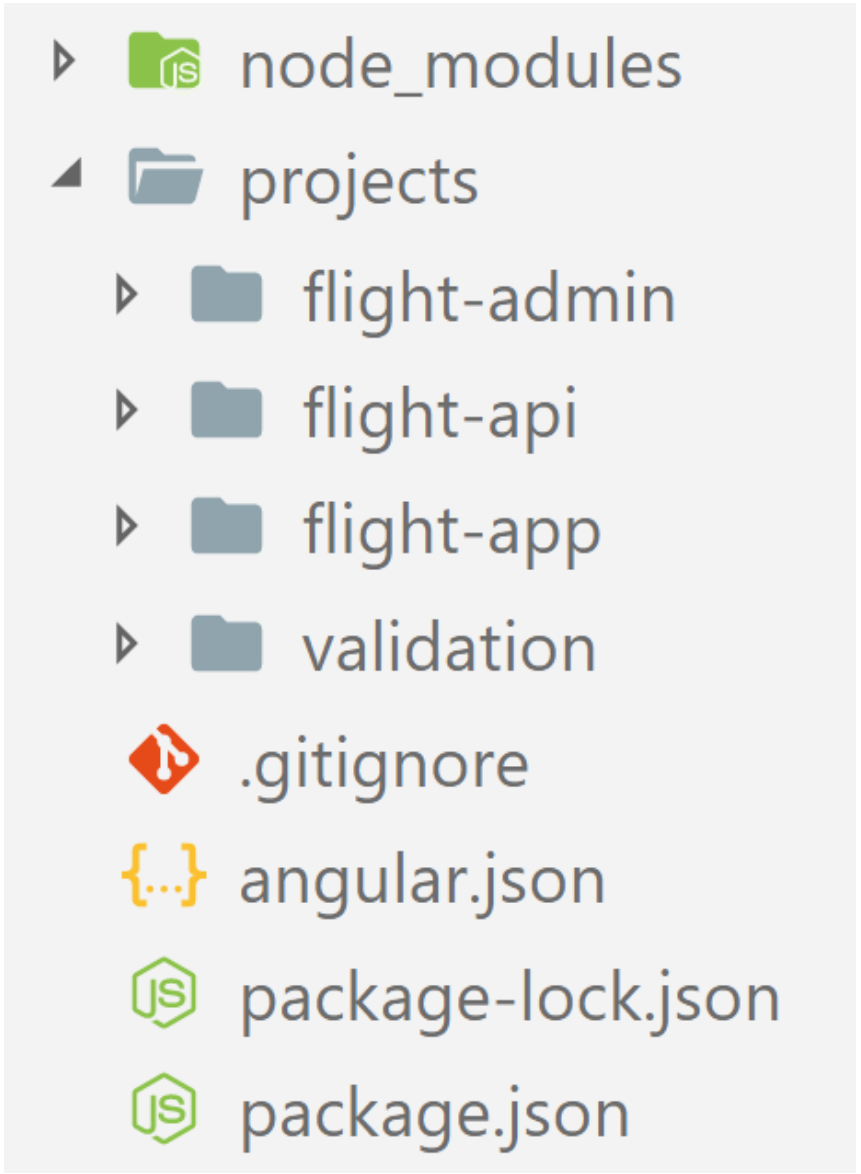
Root Module **Feature Modules** **Shared Modules**

Outline

- Nx Monorepos
- Strategic Design and DDD
- Micro Frontends
- Module Federation


Monorepos

Monorepo Structure



Advantages

- Everyone uses the latest versions
- No version conflicts
- No burden with distributing libs
- Creating new libs: Adding folder
- Experience: Successfully used at Google, Facebook, …

Two Flavors

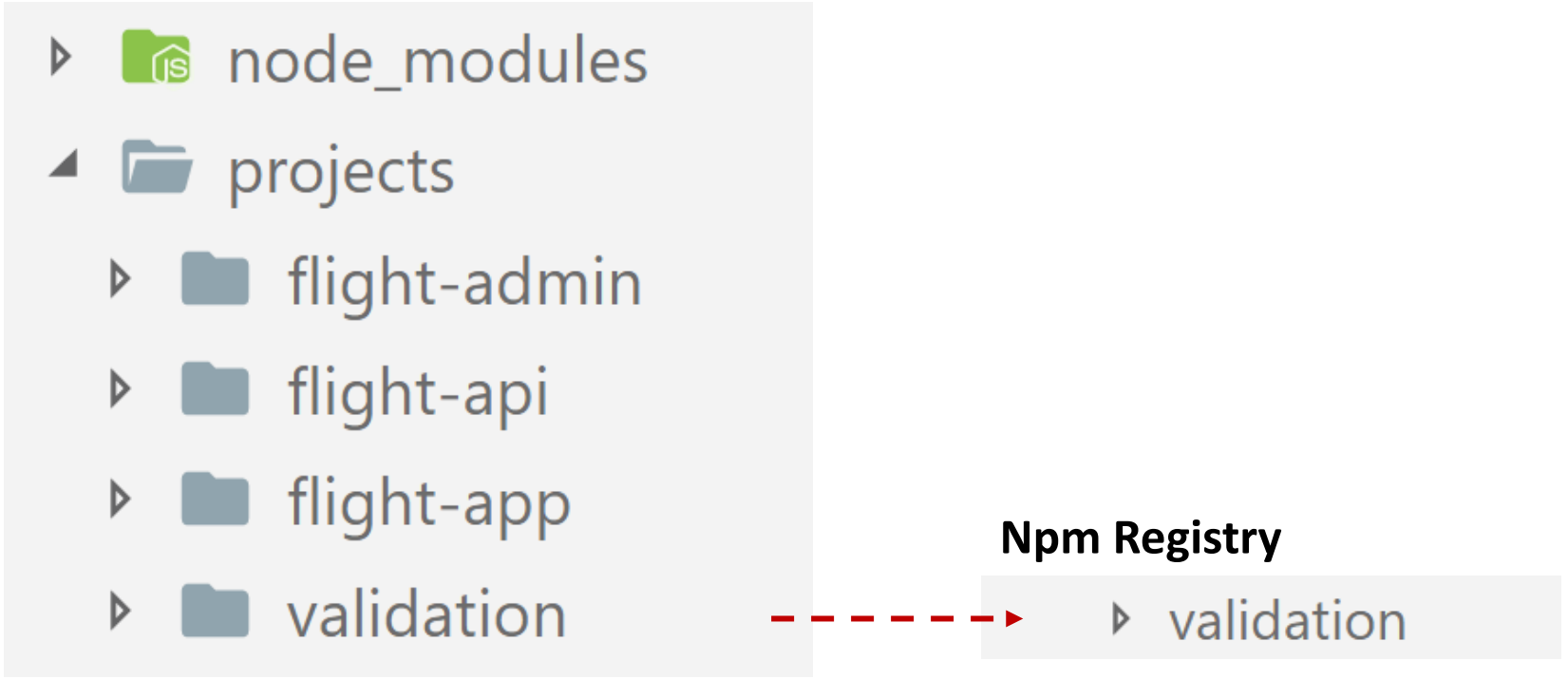
Project Monorepo

- Like Workspaces/Solutions in different IDEs

Company-wide Monorepo

- E. g. used at Google or Facebook

Moving back and forth



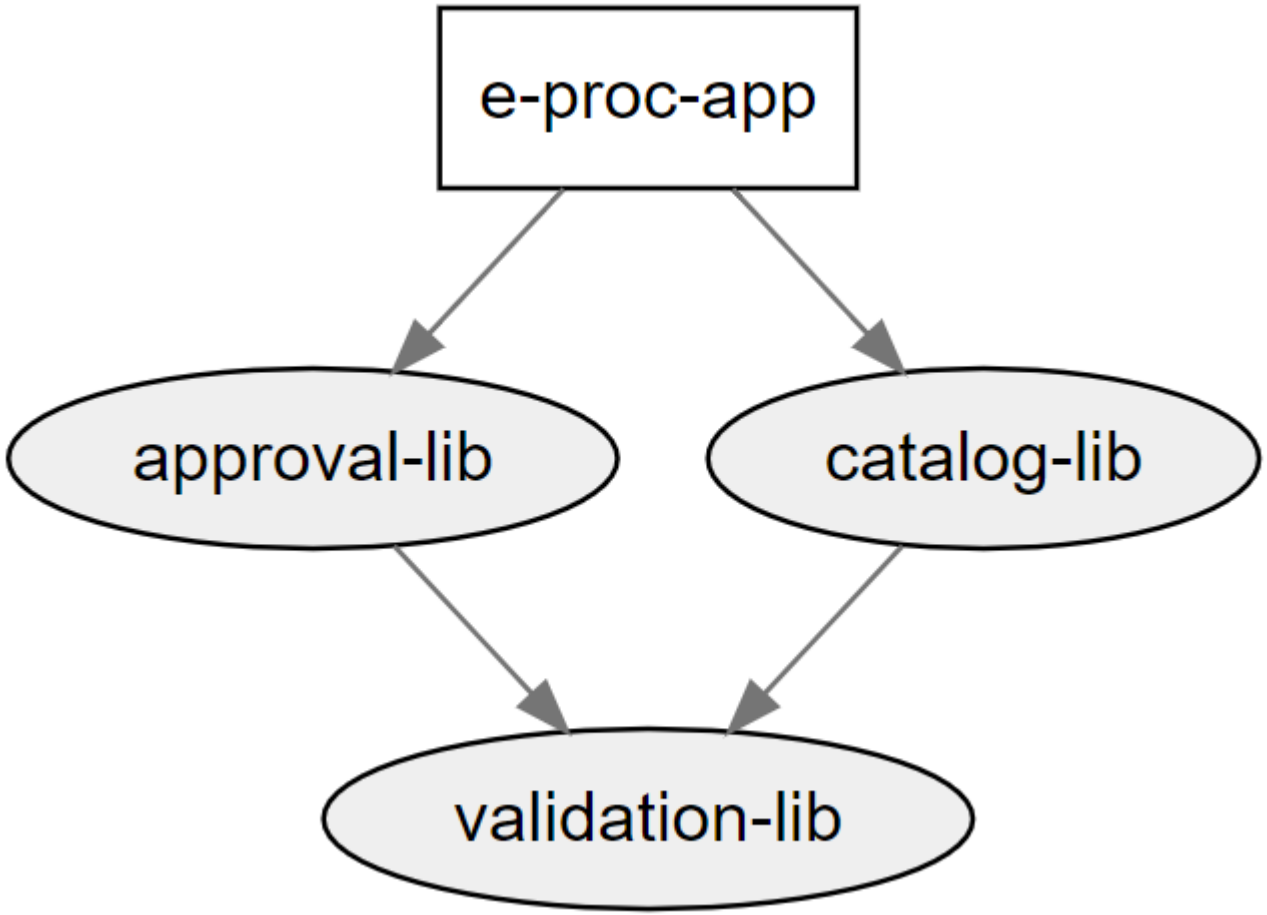
Tooling & Generator

https://nrwl.io/nx

Nrwl Extensions for Angular

An open source toolkit for enterprise Angular applications.

Visualize Module Structure



Features of Nx

- Visualize module structure and dependencies
- Addtional schematics / generators (nx g app/lib/… also for NgRx)
- Access restrictions: which apps/libs can access which libs (via ESLint)
- Just recompile changed apps/libs (works w/o cloud cache!)
- Support for
  - ESLint
  - NgRx
  - Jest, Cypress & Storybook

Creating a Workspace

```
npm install -g @angular/cli

ng new workspace

cd workspace

ng generate app my-app
ng generate lib my-lib

ng serve --project my-app
ng build --project my-app
```

Creating a Workspace

```
npm install -g @angular/cli

npm init nx-workspace workspace

cd workspace

nx generate app my-app
nx generate lib my-lib --buildable

nx serve --project my-app
nx build --project my-app
```

DEMO

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Libraries and Monorepo

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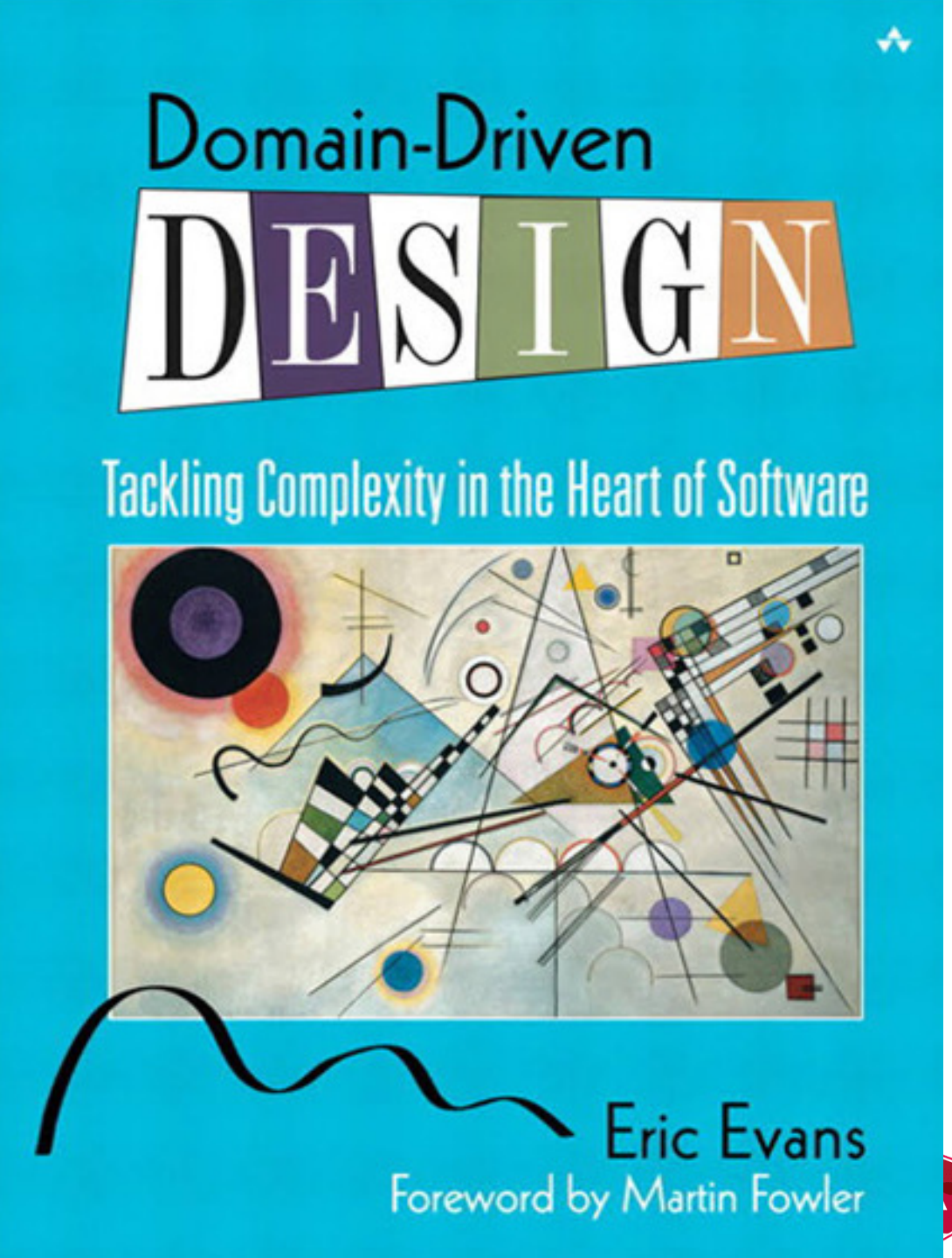
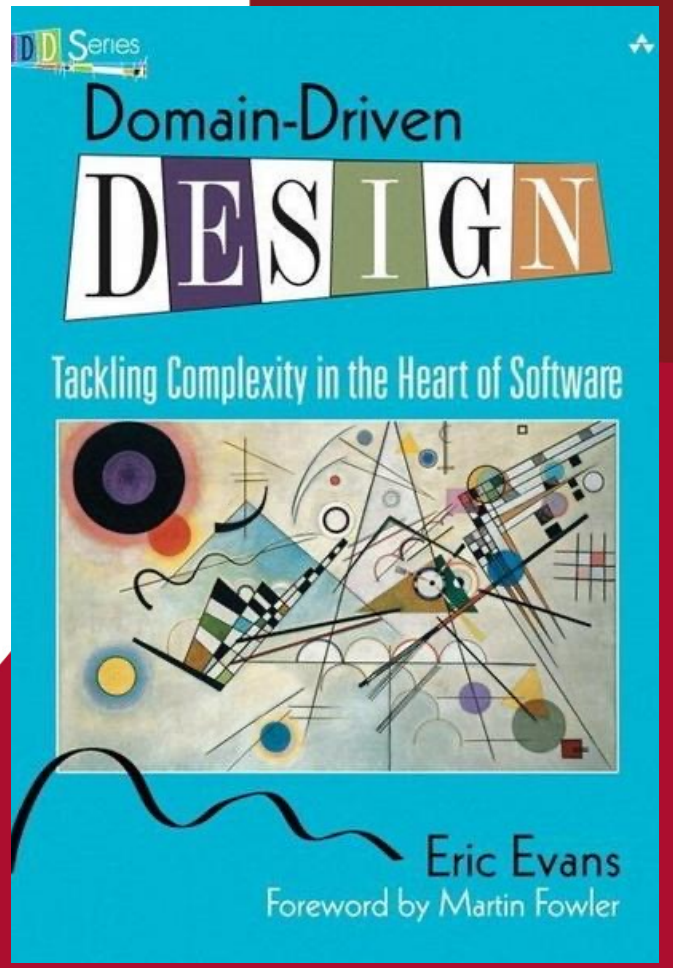
DDD

in a nutshell



Methodology for bridging the gap b/w requirements and architecture/ design

How to create sustainable frontend architectures with ideas from DDD?



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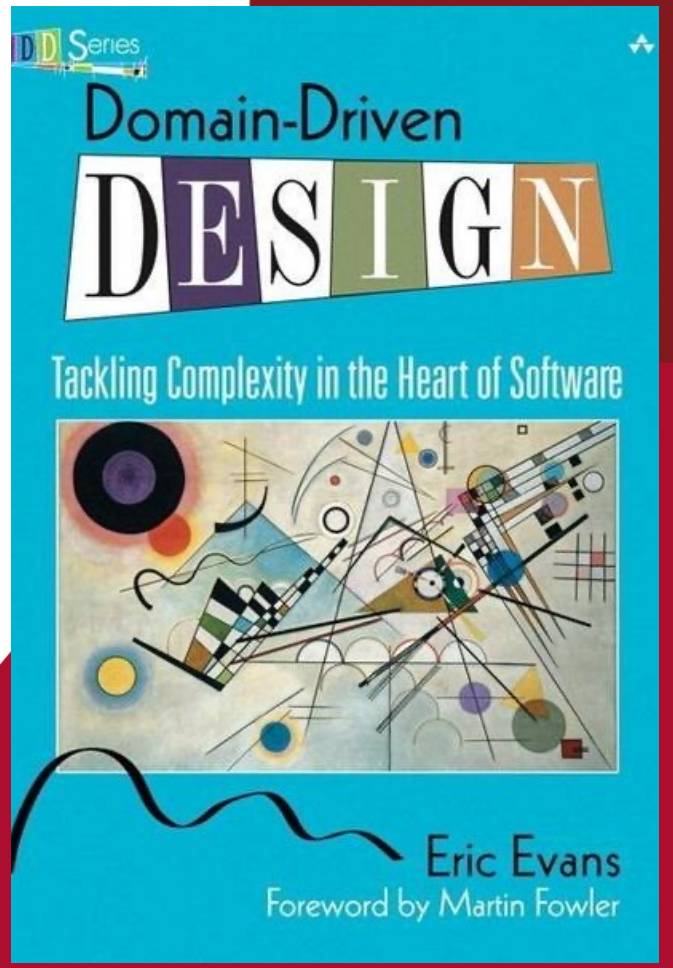
How to create **sustainable** frontend architectures with **ideas from DDD**?



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Domain Driven Design

Decomposing a System

Design Patterns
& Practices

Strategic Design

Tactical Design

Domain Driven Design

Decomposing a System

Design Patterns
& Practices

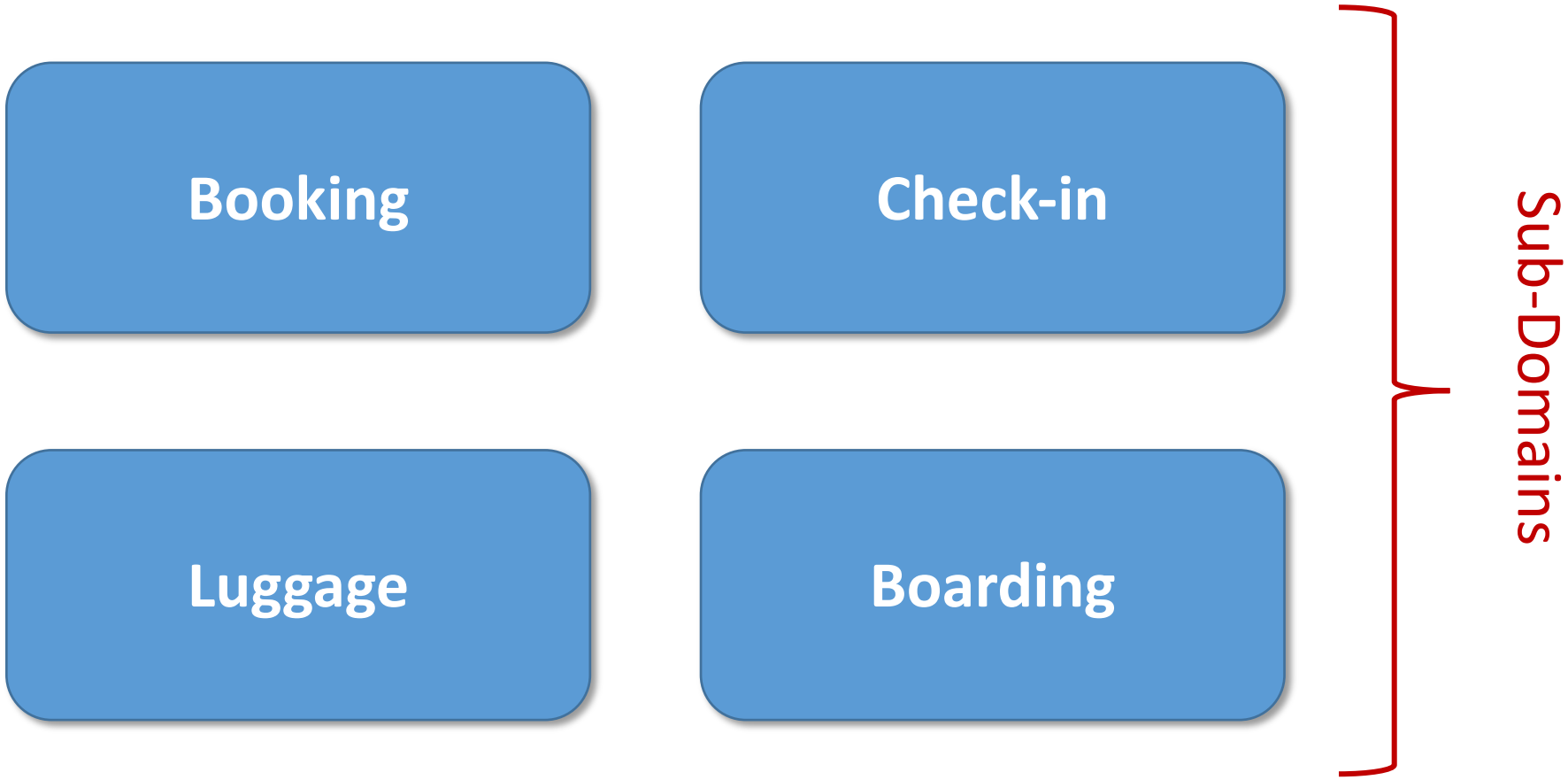
Strategic Design

Tactical Design

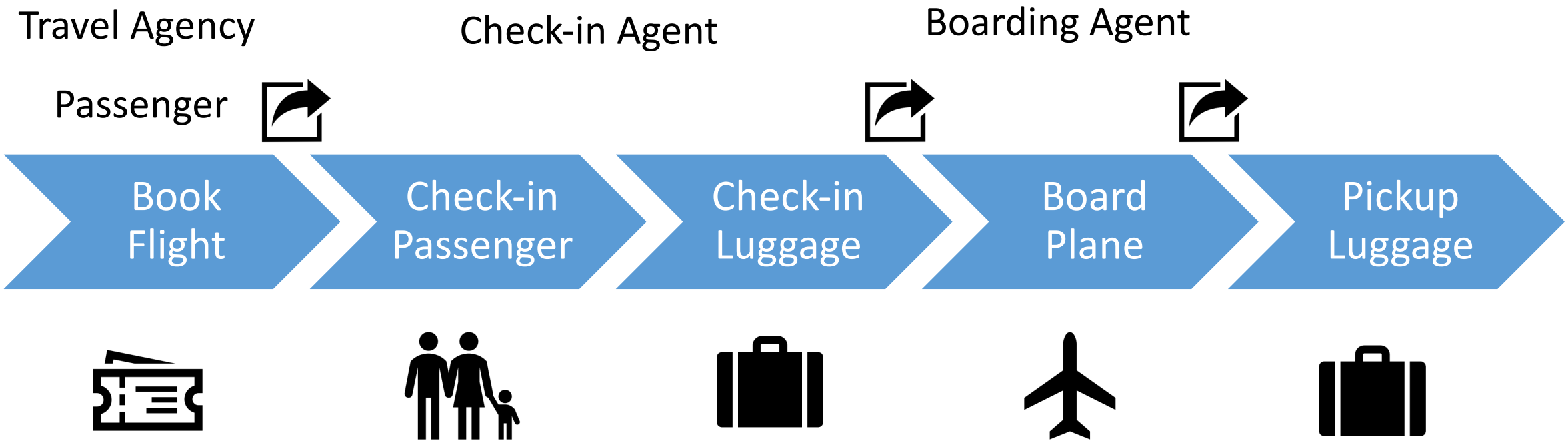

This is what Strategic DDD prevents

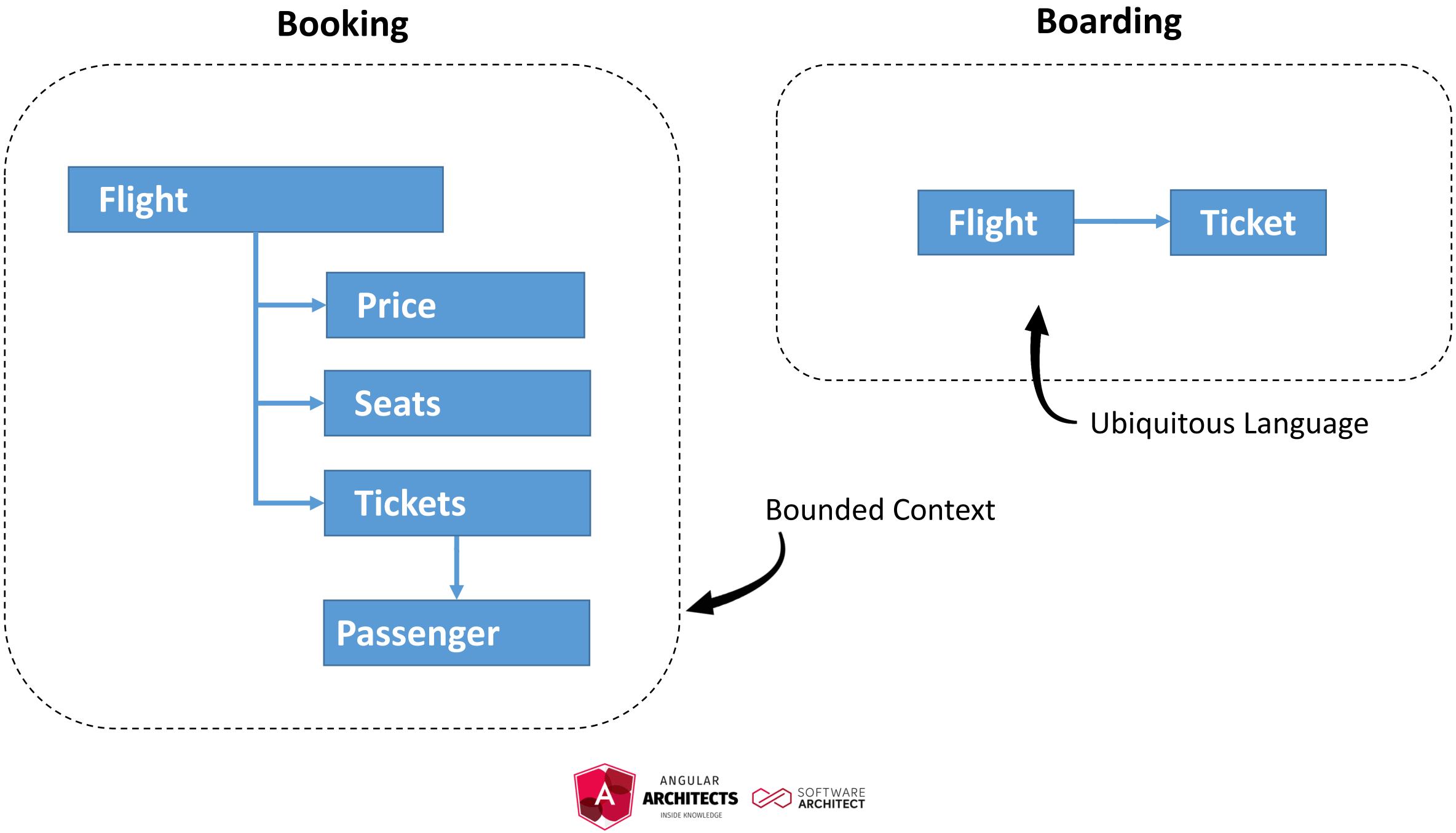
Example

Example

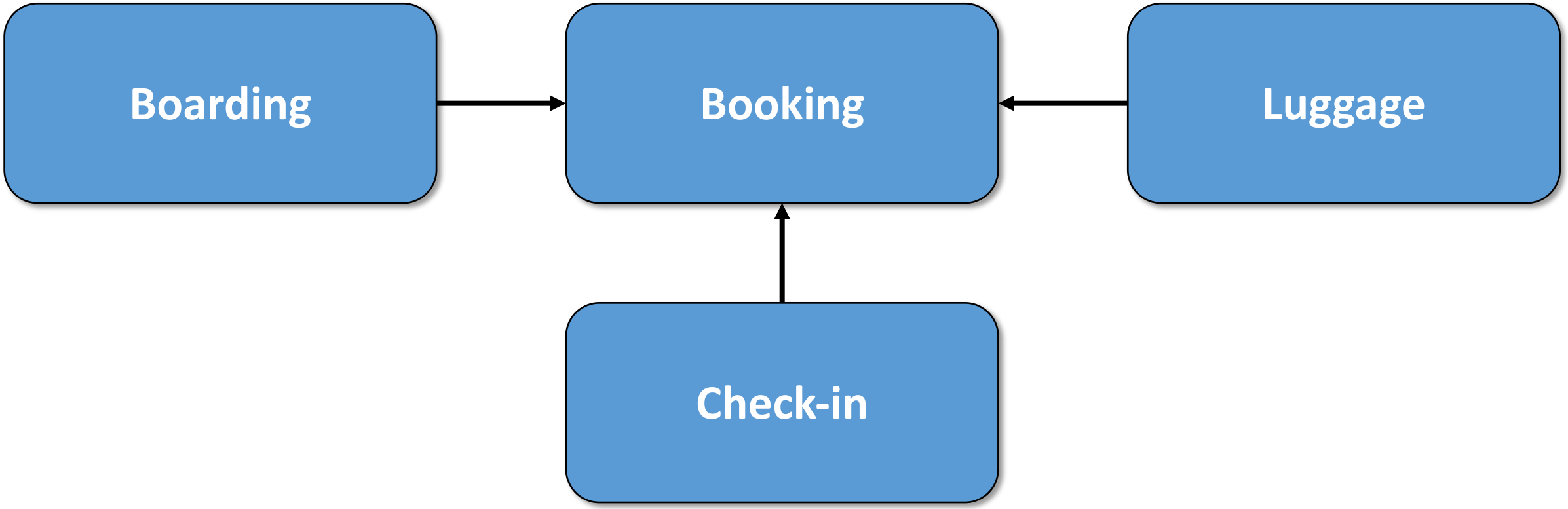


Finding Sub-Domains




Booking
Flight
Price
Seats
Tickets
Passenger
Boarding
Flight
Ticket
Ubiquitous Language
Bounded Context

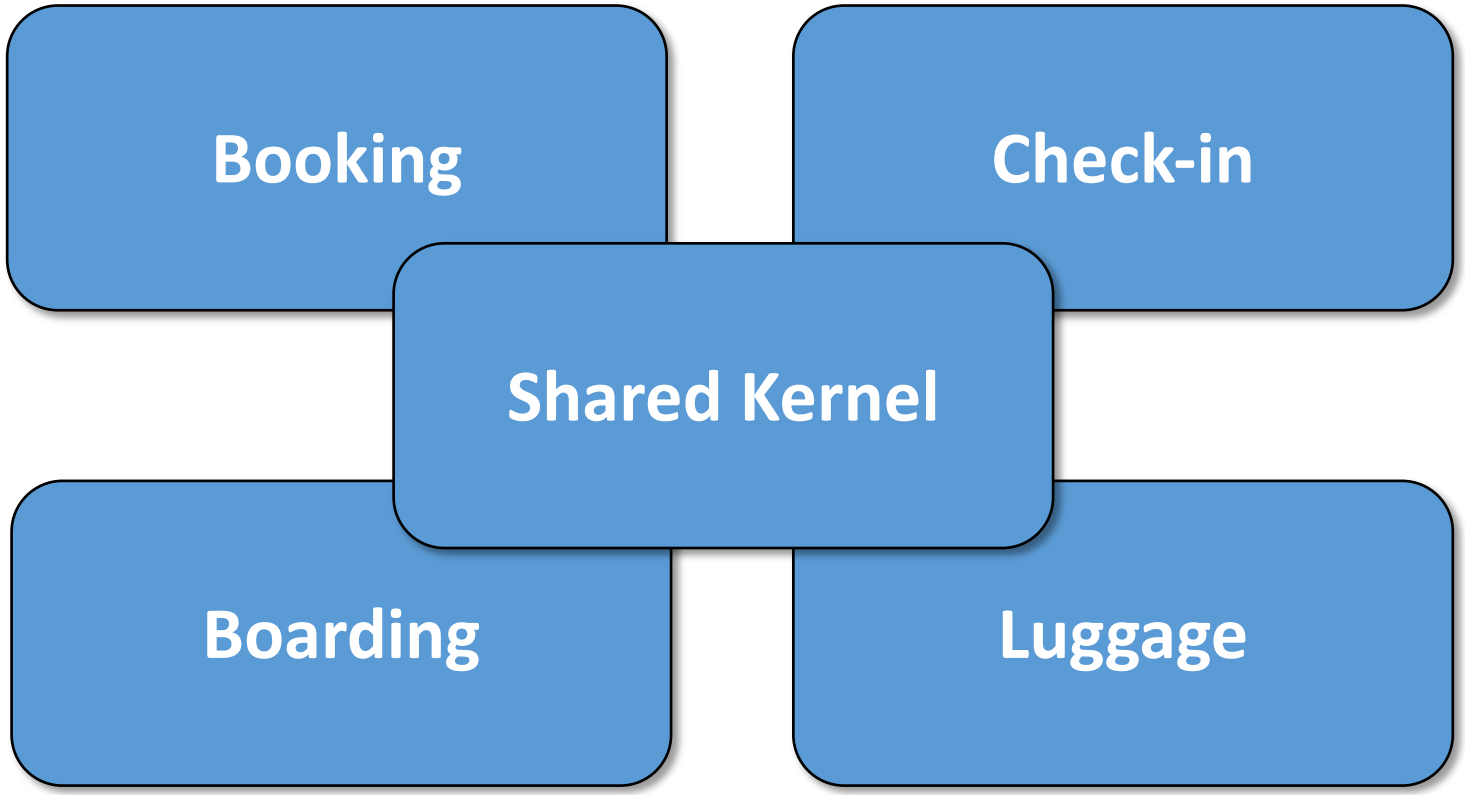
Context Map

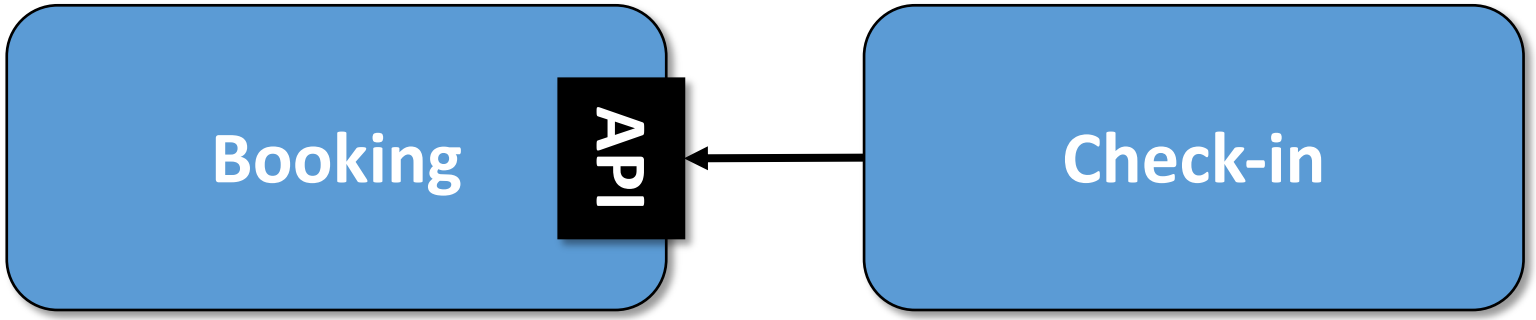


Context Map

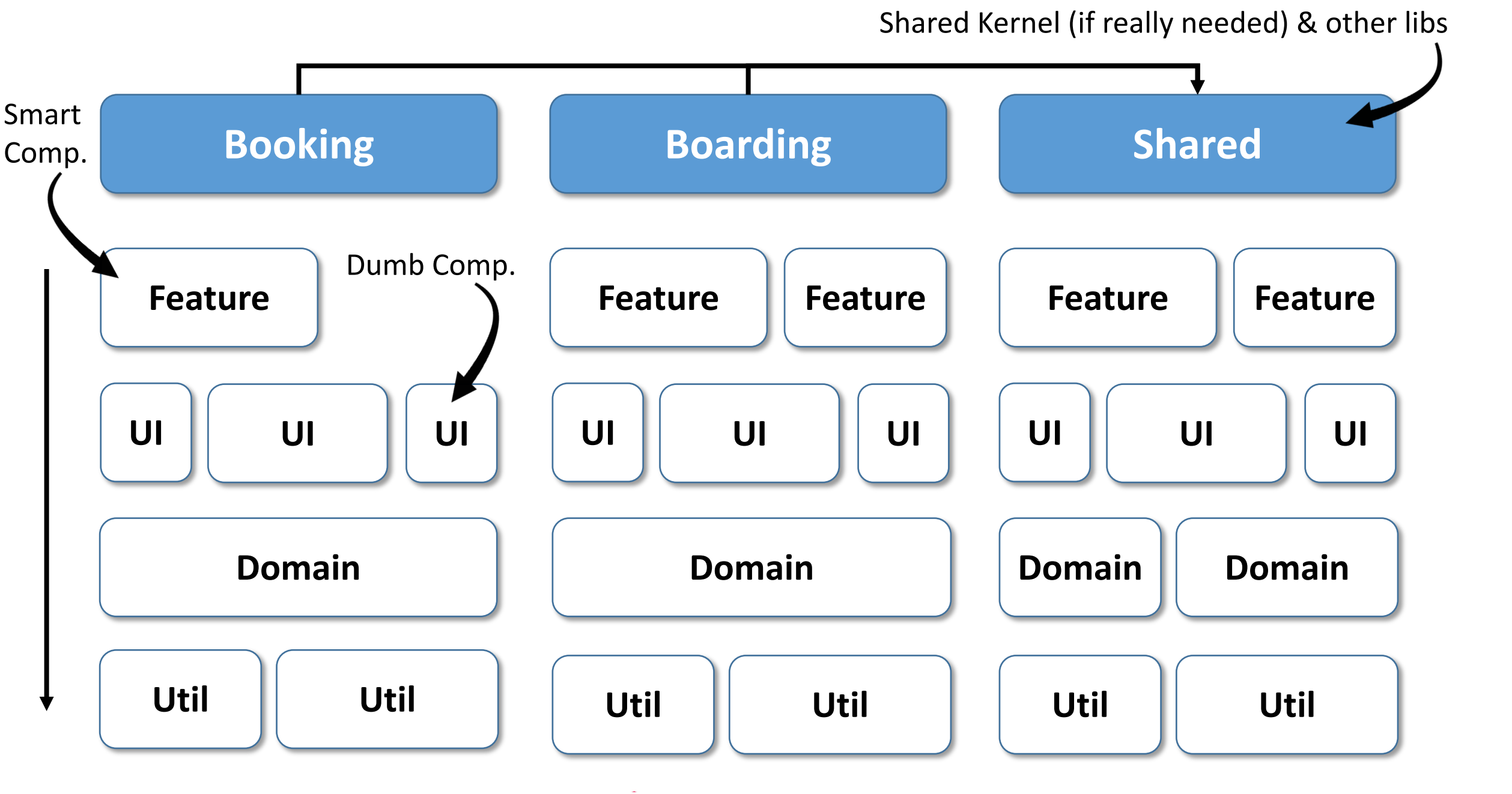
Responsibilities?

Breaking Changes?





Open-/Host-Service


Shared Kernel (if really needed) & other libs
Smart Comp.
Booking
Boarding
Shared
Feature
Dumb Comp.
Feature
Feature
Feature
Feature
UI
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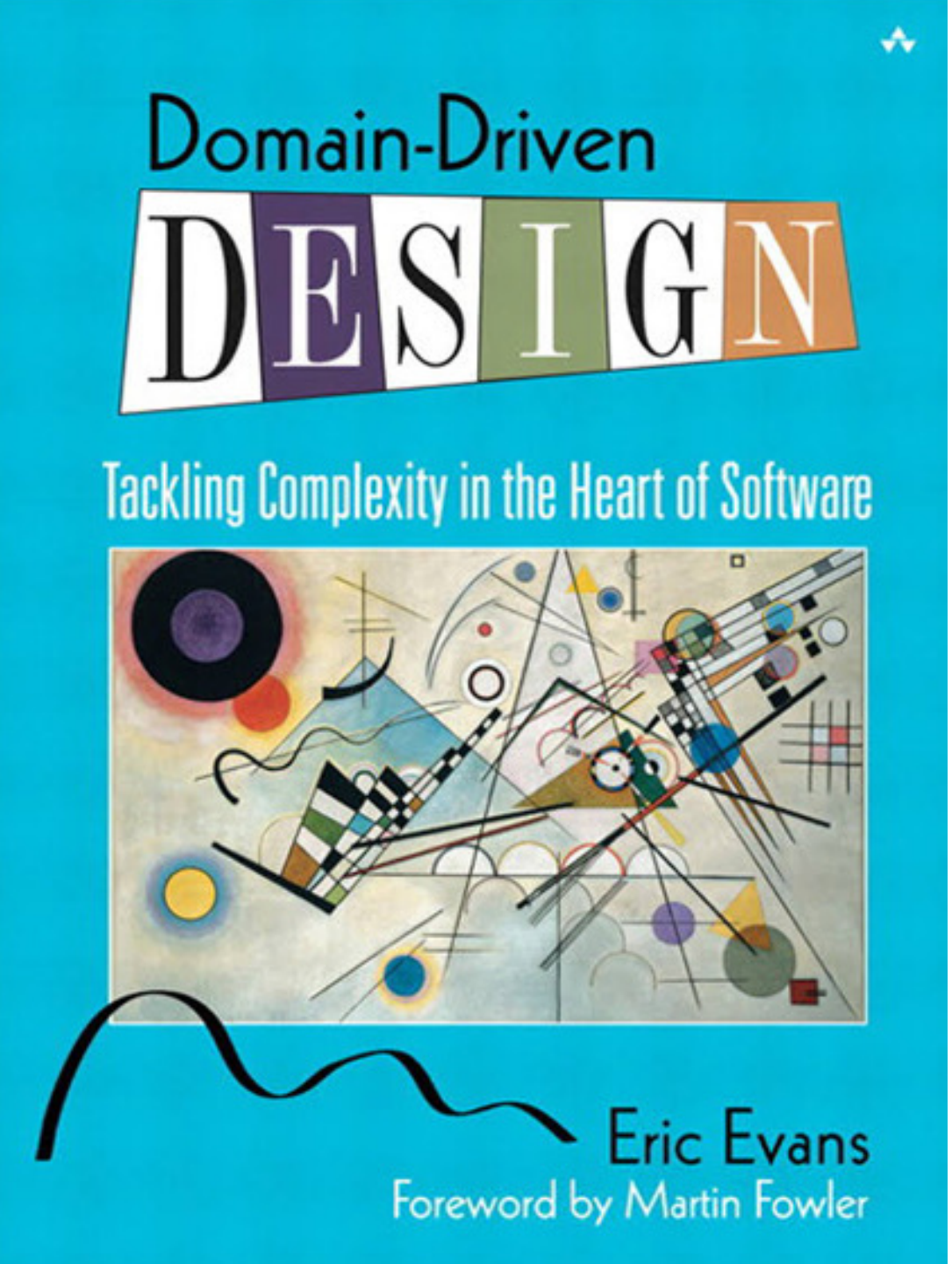
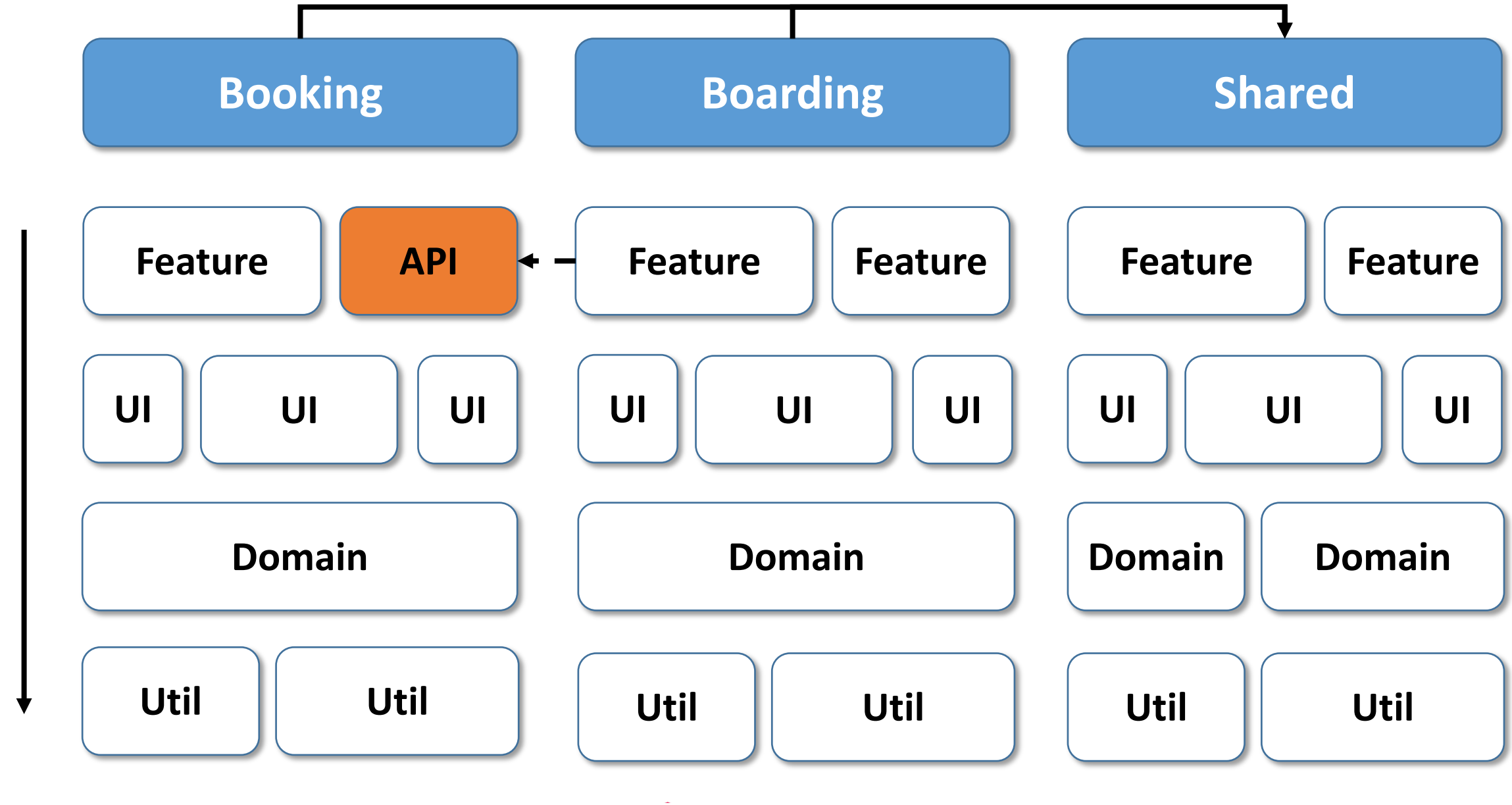


Lots of approaches for cross-domain communication and more …


Booking
Boarding
Shared
Feature
API
Feature
Feature
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Util
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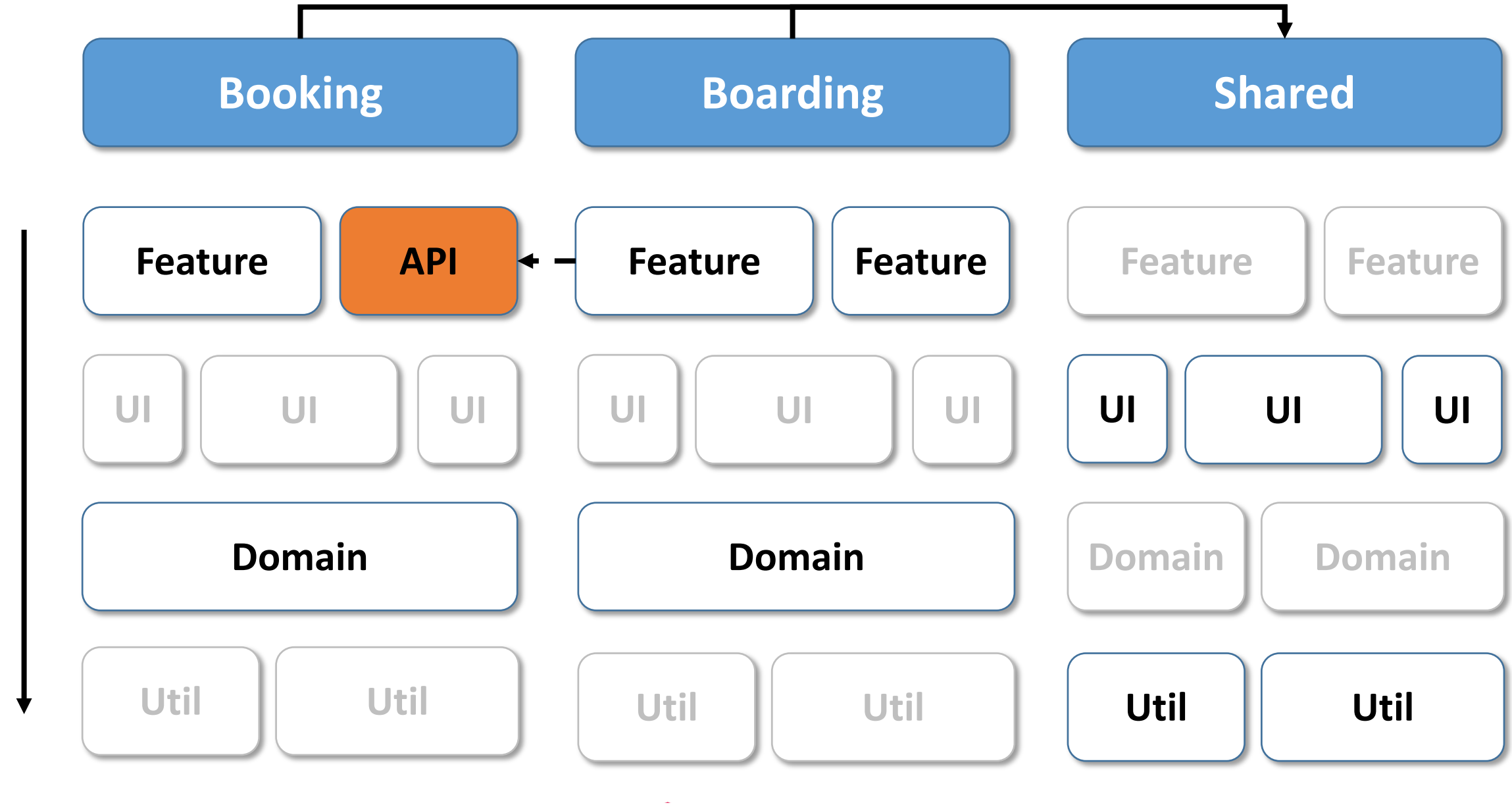
Util


Booking
Boarding
Shared
Feature
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Feature
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Feature
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UI
UI
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Domain
Domain
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Domain
Util
Util
Util
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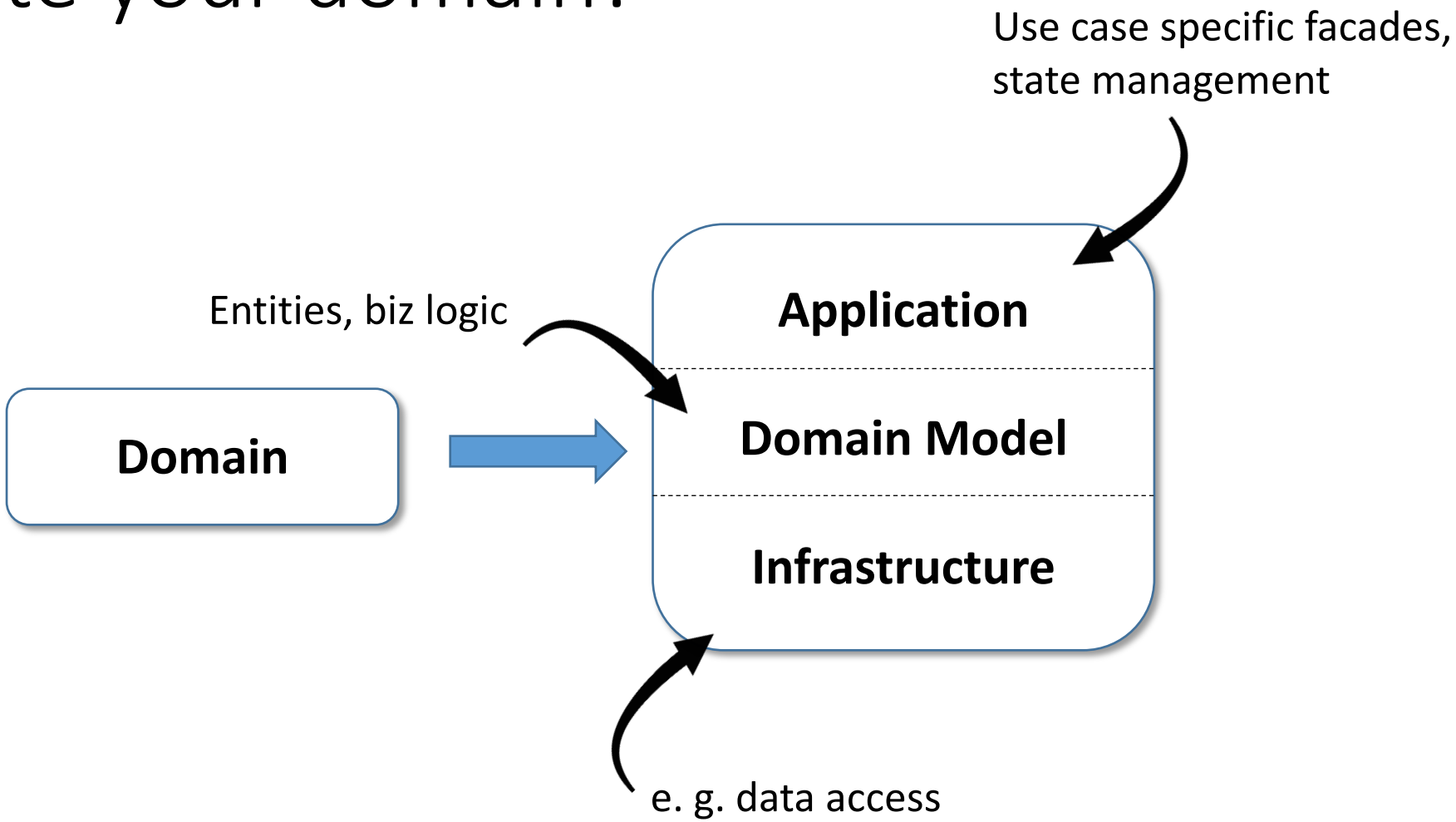
Util
Util

Isolate your domain!



Alternatives to layering

- e. g. Hexagonal Architecture, Clean Architecture
- Anyway: We need to **restrict access** b/w libraries

Finegrained Libraries

- Unit of recompilation
- Unit of retesting
- Access restrictions
- Information Hiding
- Easy: Just *ng g lib …*
- Future replacement for NgModules?

Categories for Libraries with Nx - I

From the free e-book about Monorepo Patterns

- **feature**: Implements use case controller (smart) components
- **ui**: Provides use case agnostic, thus reusable (dumb) presentational components
- **data-access:** Contains REST (or GraphQL) services that function as client-side delegate layers to server tier APIs
- **util**: Provides common utilities/services/helper functions

Categories for Libraries with Nx - II

NX access restrictions between libs

E.g. a “util” lib is not able to depend on a ”feature” lib (or even an app)

Categories for Libraries with DDD

In addition, we're also using the following categories:

- **shell**: For an application that contains multiple domains, a shell provides the entry point for a domain
- **api**: Provides functionalities exposed for other domains
- **domain**: Domain logic like calculating additional expanses

Nx type:tags for Libraries incl. DDD

- e2e
- app / shell
- feature / api
- ui
- data-access
- domain(-logic)
- util

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Nx DDD

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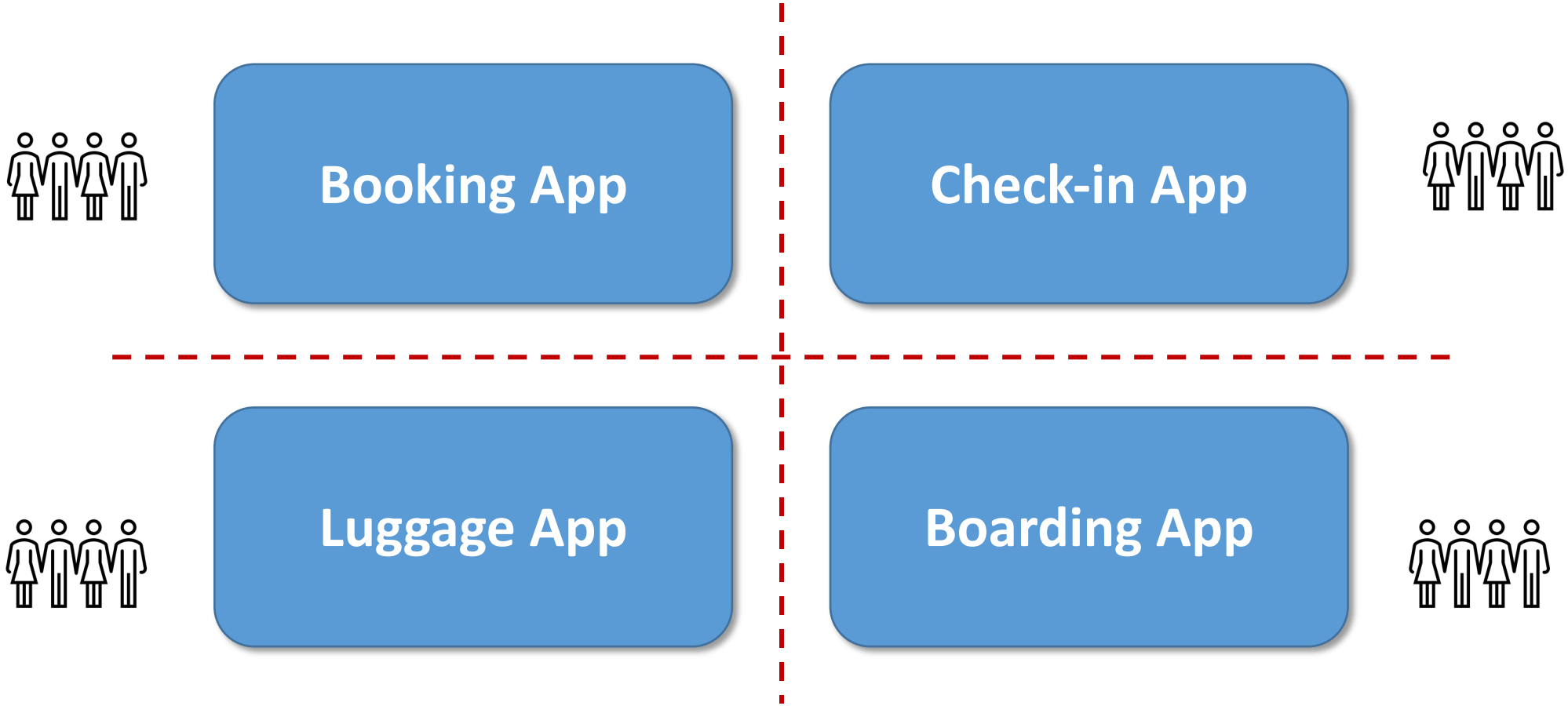
Micro Frontends?

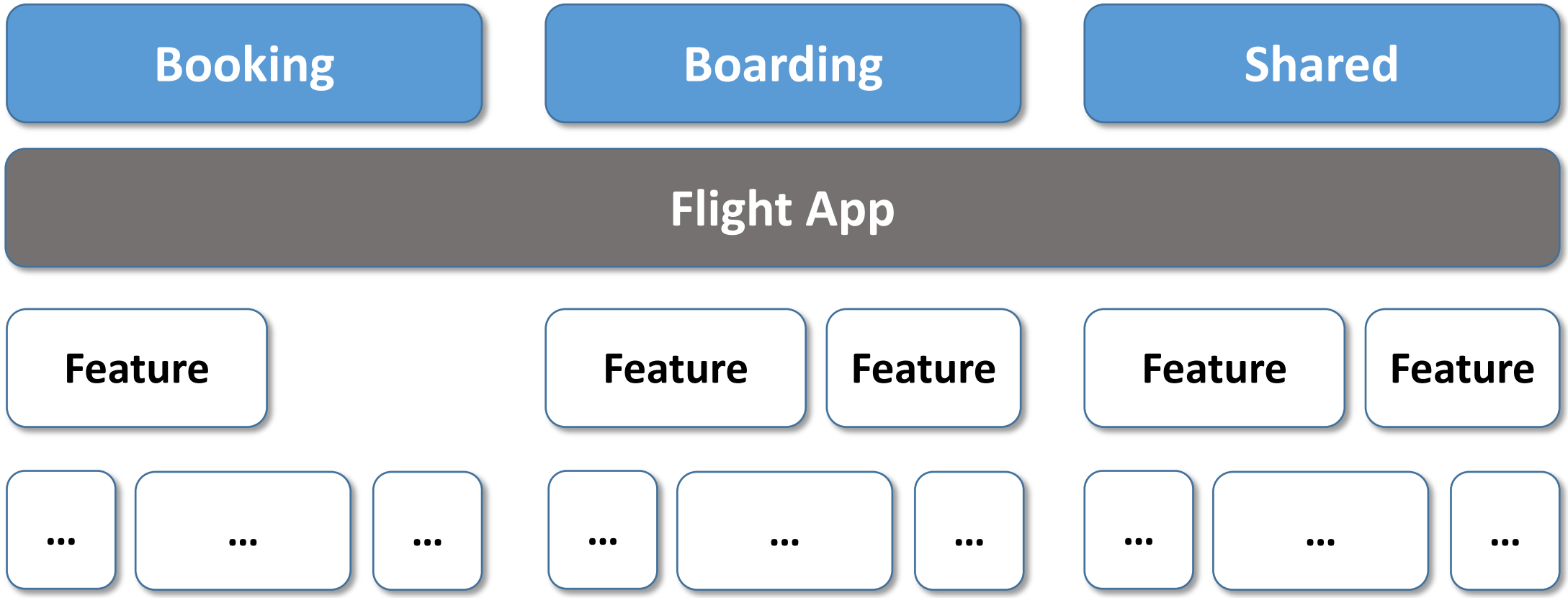
Short outlook

Microfrontends

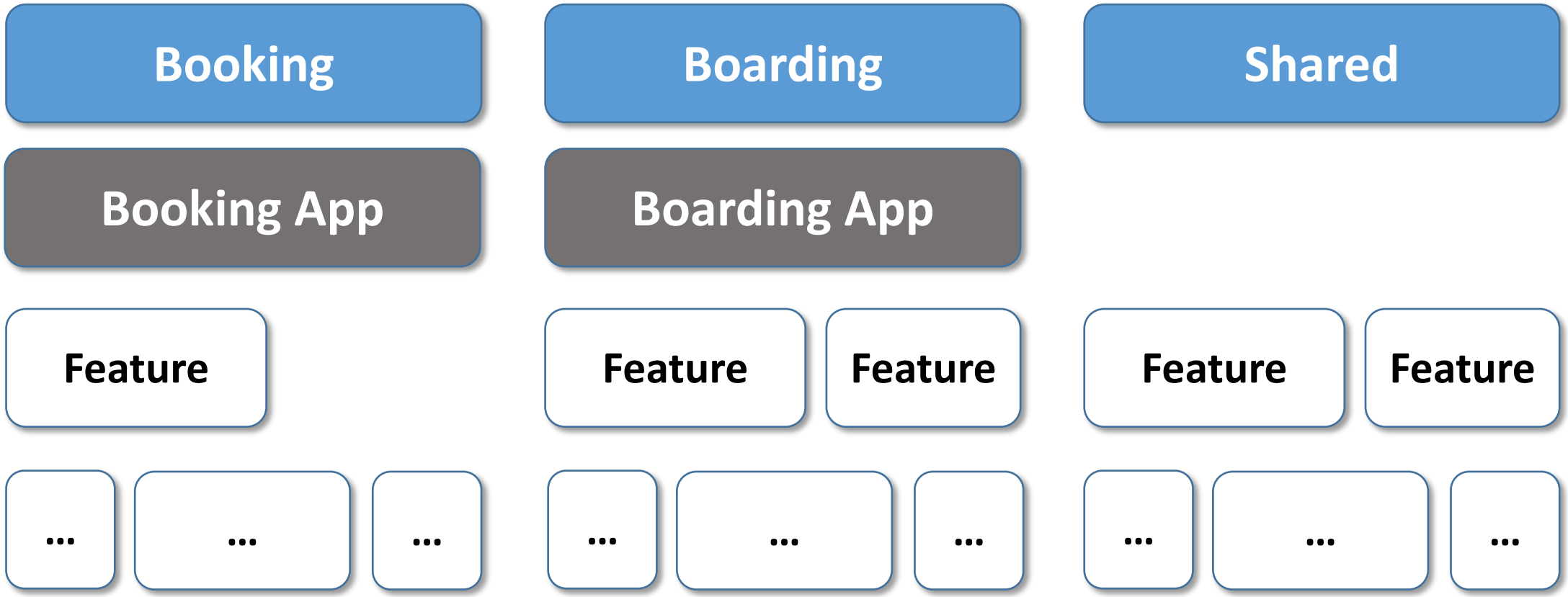


Microfrontends
are first and foremost
about **scaling teams!**

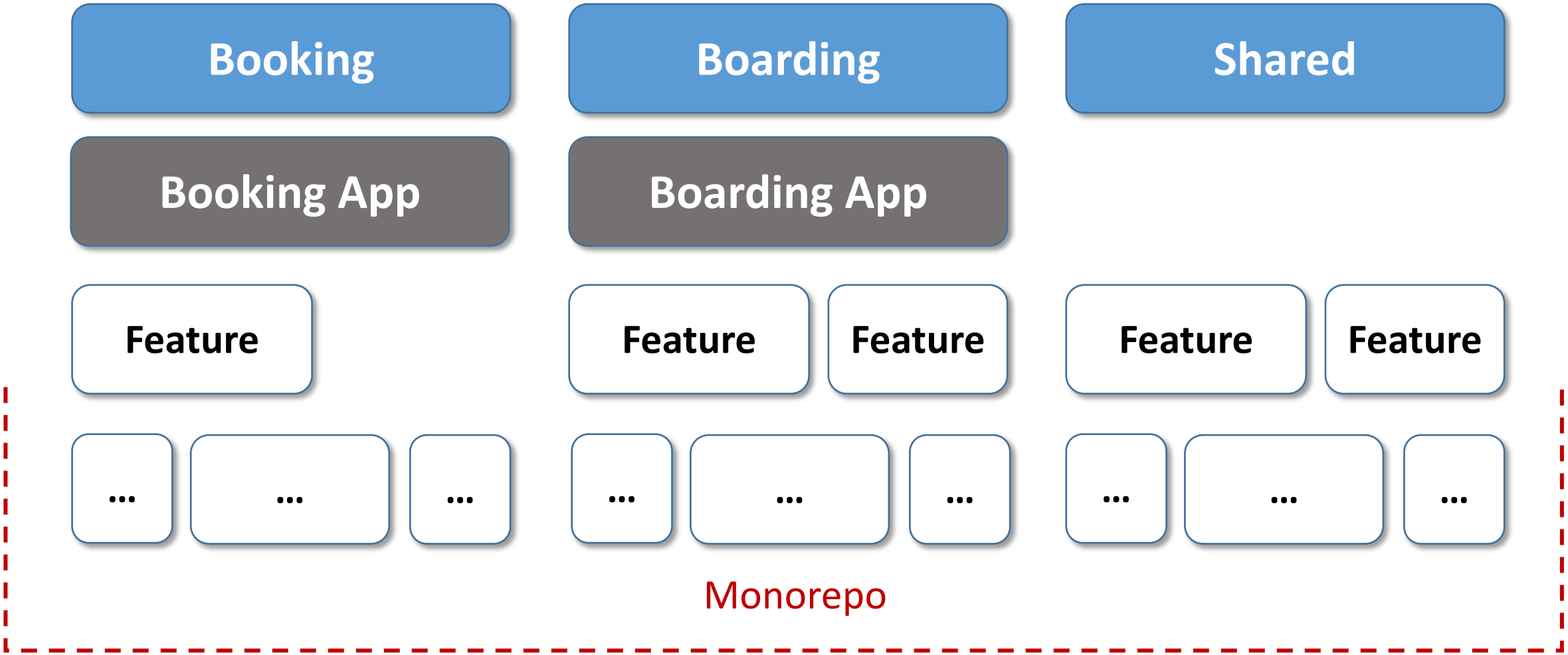
Deployment Monolith



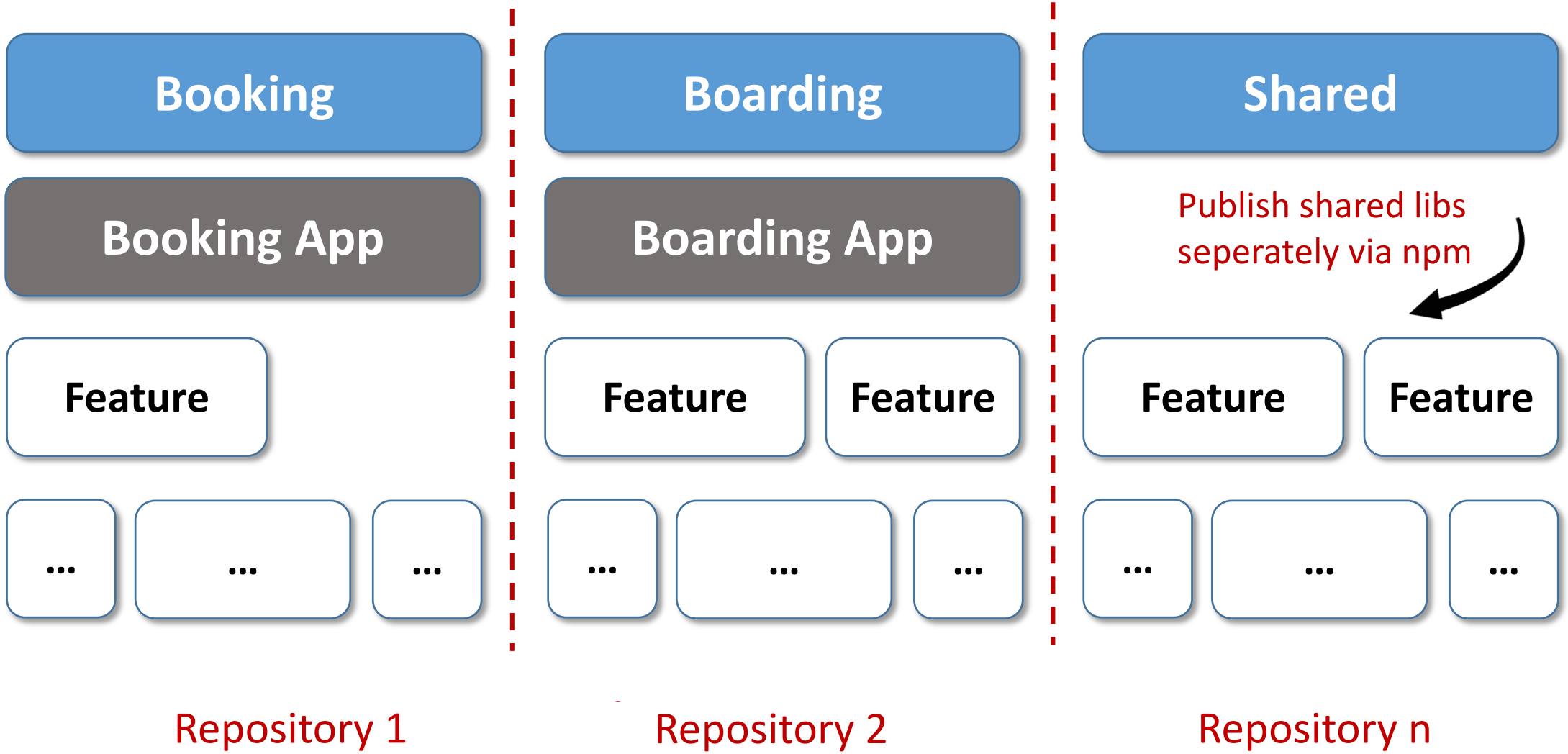
Microfrontends



Option 1: One App per Domain



Option 2: One Monorepo per Domain

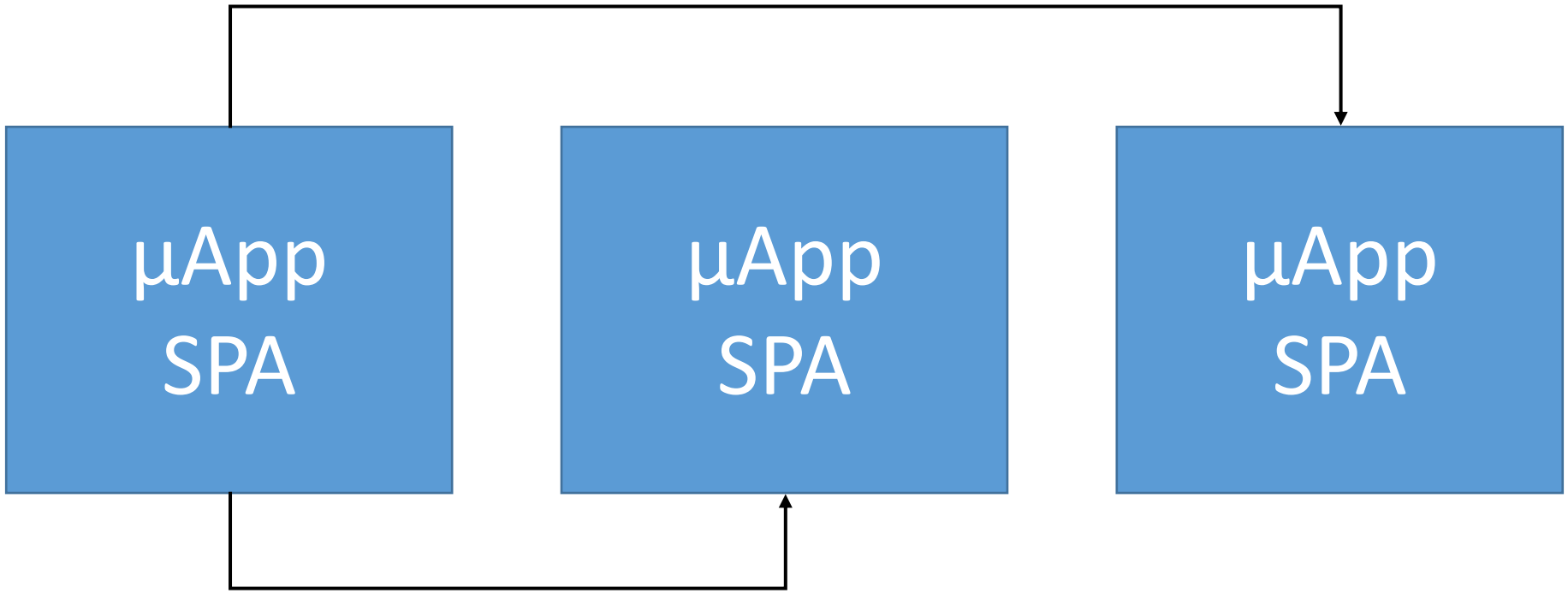


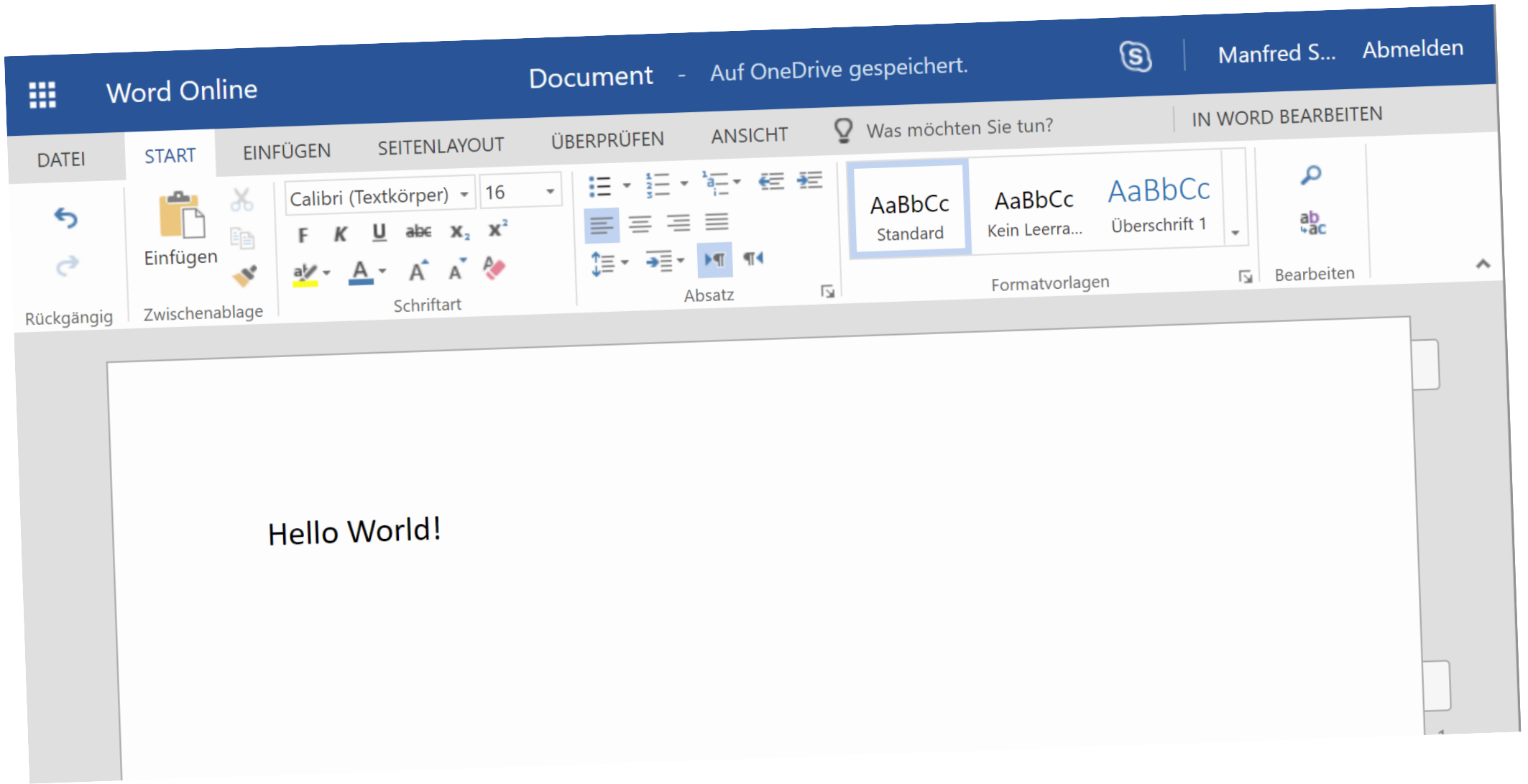
Benefits

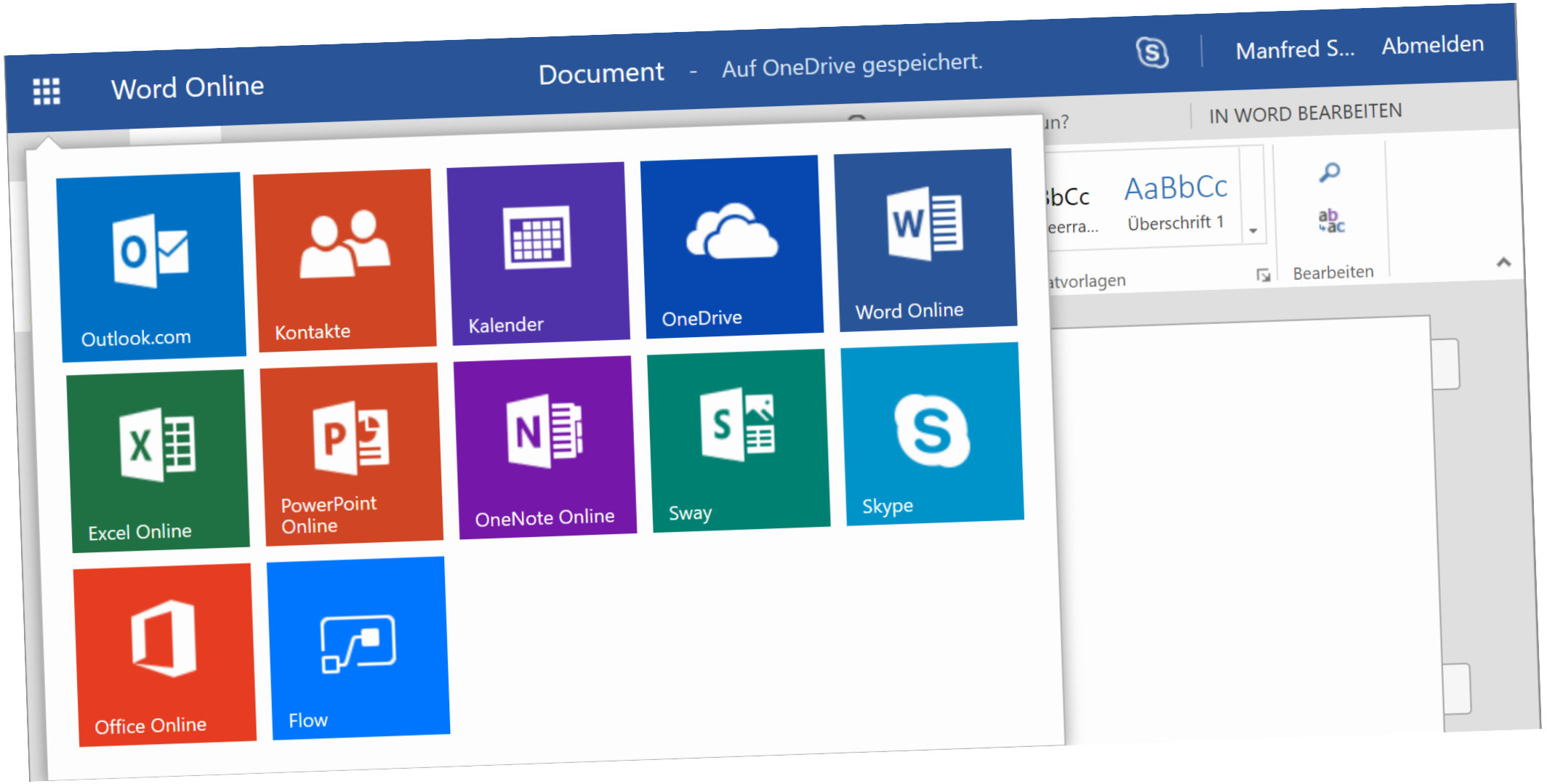
- **Autonomous Teams**
- Separate Development
- Separate Deployment
- Own architecture decisions
- Own technology descisions

Integration via Hyperlinks

UI Composition w/ Hyperlinks








Integration via
Shell

Providing a (SPA based) Shell (aka Host)

Lazy Loading?

- This is more than lazy loading
- This is about loading part **NOT KNOWN** at runtime

Providing a (SPA based) Shell

- iframes
- Bootstrapping several SPAs
  - + Lazy Loading

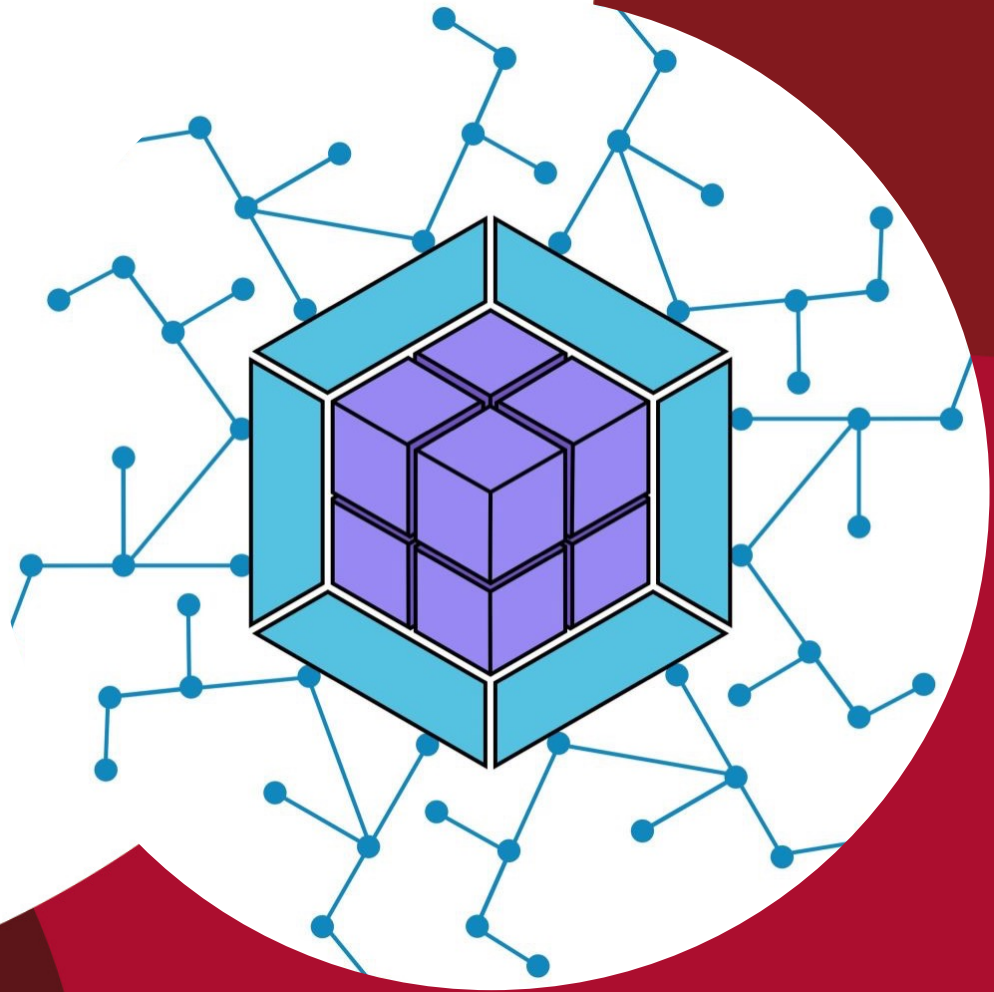
Loading MicroApps

```
<script src="micro-app.bundle.js"></script>

<micro-app></micro-app>
```

Loading Separately Compiled SPAs

```
const script = document.createElement('script');
script.src = 'assets/main.bundle.js';
document.body.appendChild(script);

const clientA = document.createElement('client-a');
clientA['visible'] = true;
document.body.appendChild(clientA);
```

Webpack 5
Module Federation



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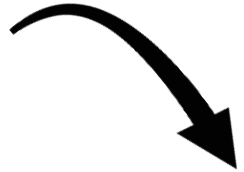
Idea

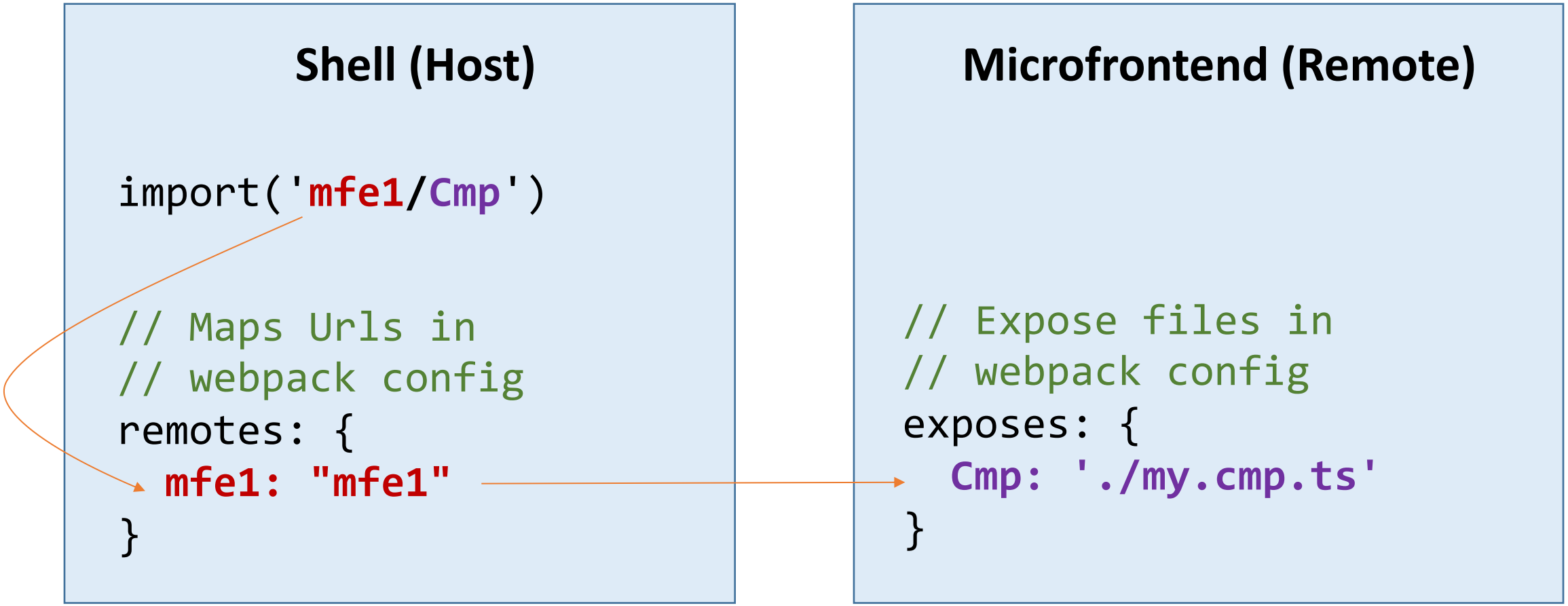
Does not work with
webpack/ Angular CLI



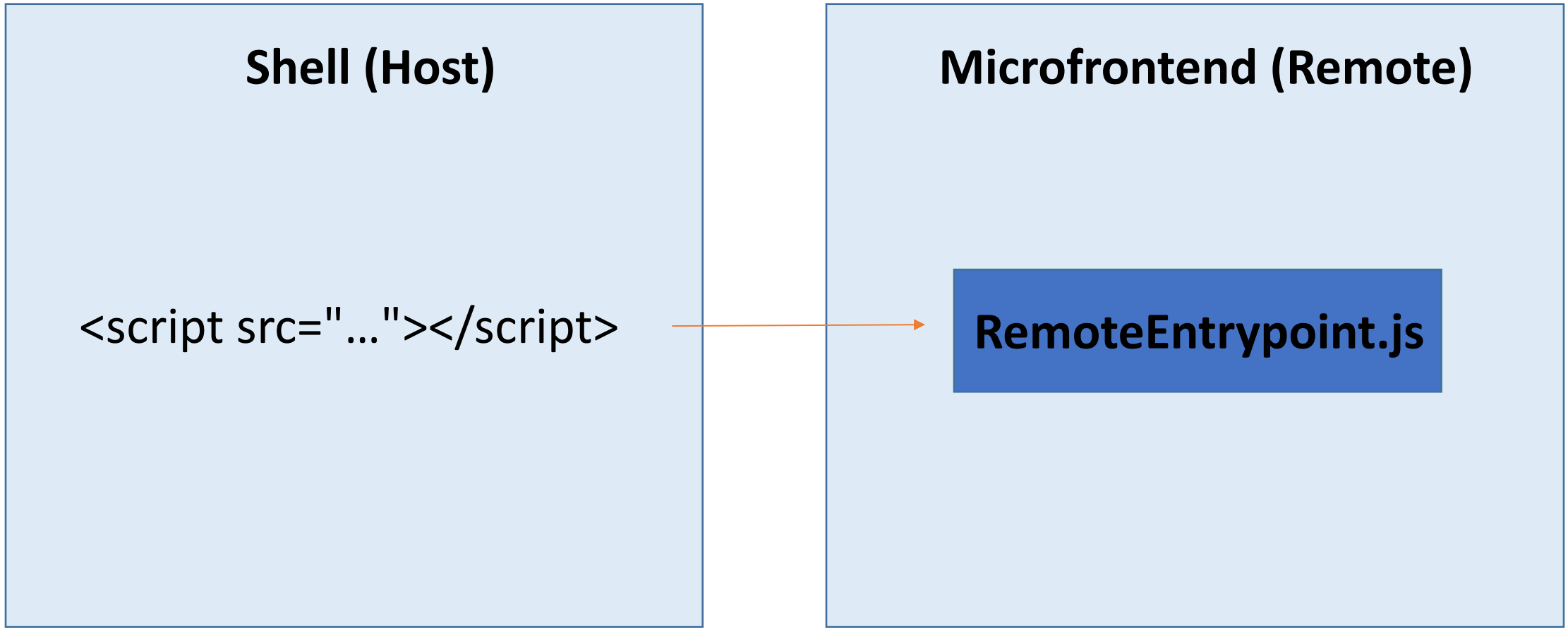
```
const Component = import('http://other-app/xyz')
```

Even lazy parts must be
known at compile time!

Webpack 5 Module Federation



How to Get the Microfrontend's URL?



How to Share Libs?

Shell (Host)

```
shared: [
  "@angular/core", "..."
]
```

Microfrontend (Remote)

```
shared: [
  "@angular/core", "..."
]
```

Dealing with Version Mismatches

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Default Behavior

Selecting the highest compatible version

Default Behavior

Conflict: No highest compatible version

Example

- Shell: my-lib: ^10.0
- MFE1: my-lib: ^10.1
- MFE2: my-lib: ^9.0
- MFE3: my-lib: ^9.1

Result:

- Shell and MFE1 share ^10.1
- MFE2 and MFE3 share ^9.1

Configuring Singletons

```
shared: {
  "my-lib": {
    singleton: true
  }
}
```

11.0 ✓ 10.1 ✗

Configuring Singletons

```
shared: {
  "my-lib": {
    singleton: true,
    strictVersion: true // Error instead of warning!
  }
}
```

11.0 ✓ 10.1 ✗

Relaxing Version Requirements

```
shared: {
  "my-lib": {
     requiredVersion: ">=1.0.1 <11.1.1"
  }
}
```

Federated Angular:
Angular, CLI, & Module Federation

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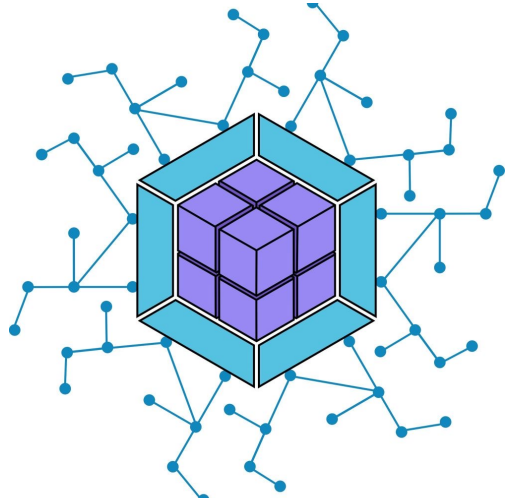
Angular CLI

?

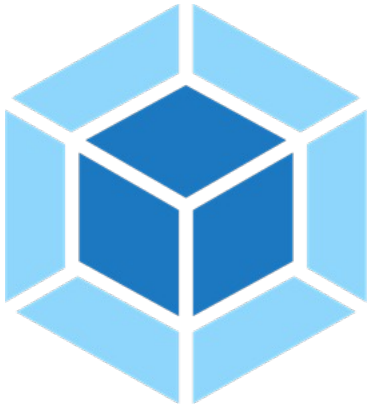
webpack



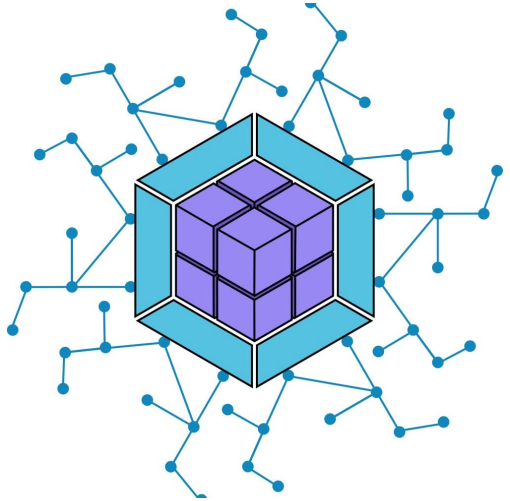
Module Federation
Configuration

Custom Builder

Angular CLI



webpack



Module Federation
Configuration

@angular-architects/module-federation

1.0.2 • Public • Published 18 hours ago

Readme | Explore BETA | 3 Dependencies

Features

- ✅ Generates the skeleton for a Module Federation config.
- ✅ Installs a custom builder to enable Module Federation.
- ✅ Assigning a new port to serve (`ng serve`) several projects at once.

Usage

1) ng add @angular-architects/module-federation
2) Use schematic to create configuration
3) Adjust generated configuration
4) ng serve

Module Federation Demo

Lab

Module Federation

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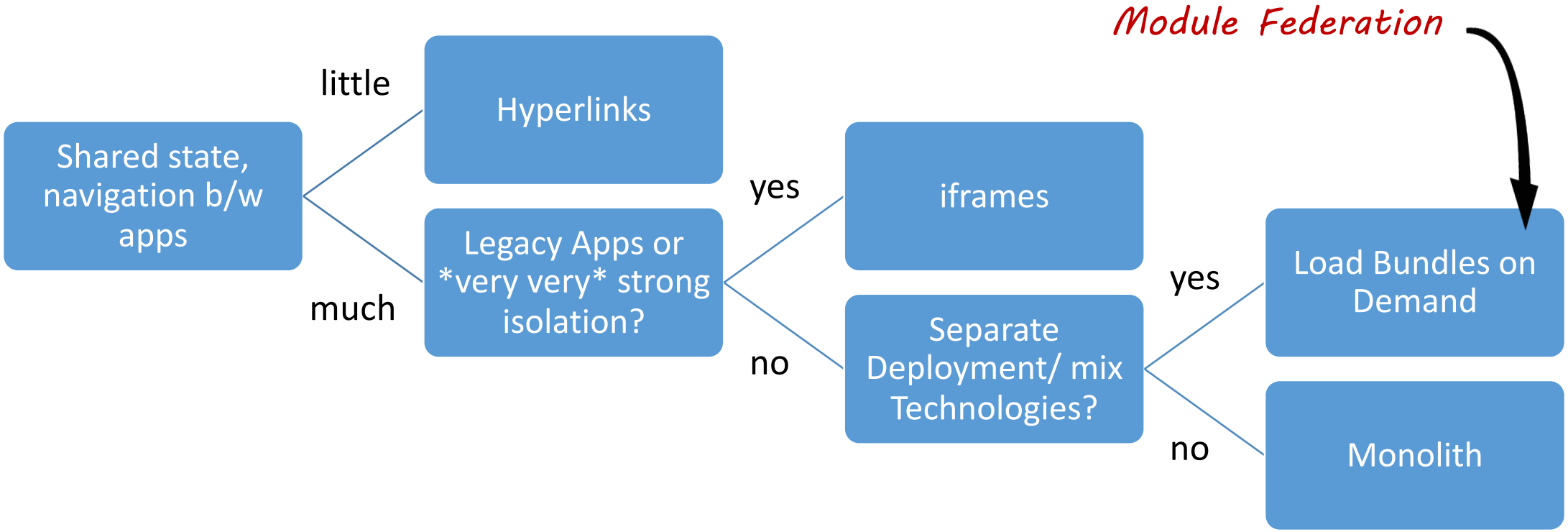
Choosing a Solution

Some General Advice



Summary

- Libs: Subdividing big solution into tiny parts
- Monorepo: No burden with distributing libs
- Strategic Design: Cut system into loosely coupled domains
- Nx: Access restrictions, visualization, incremental compilation/ testing, etc.
- Microfrontends: Autarkic Teams, separate deployment, has challenges

Like this topic?

Read Manfred's book at

https://www.angulararchitects.io/en/book/

That’s it for architecture

- Any questions left over? ☺