

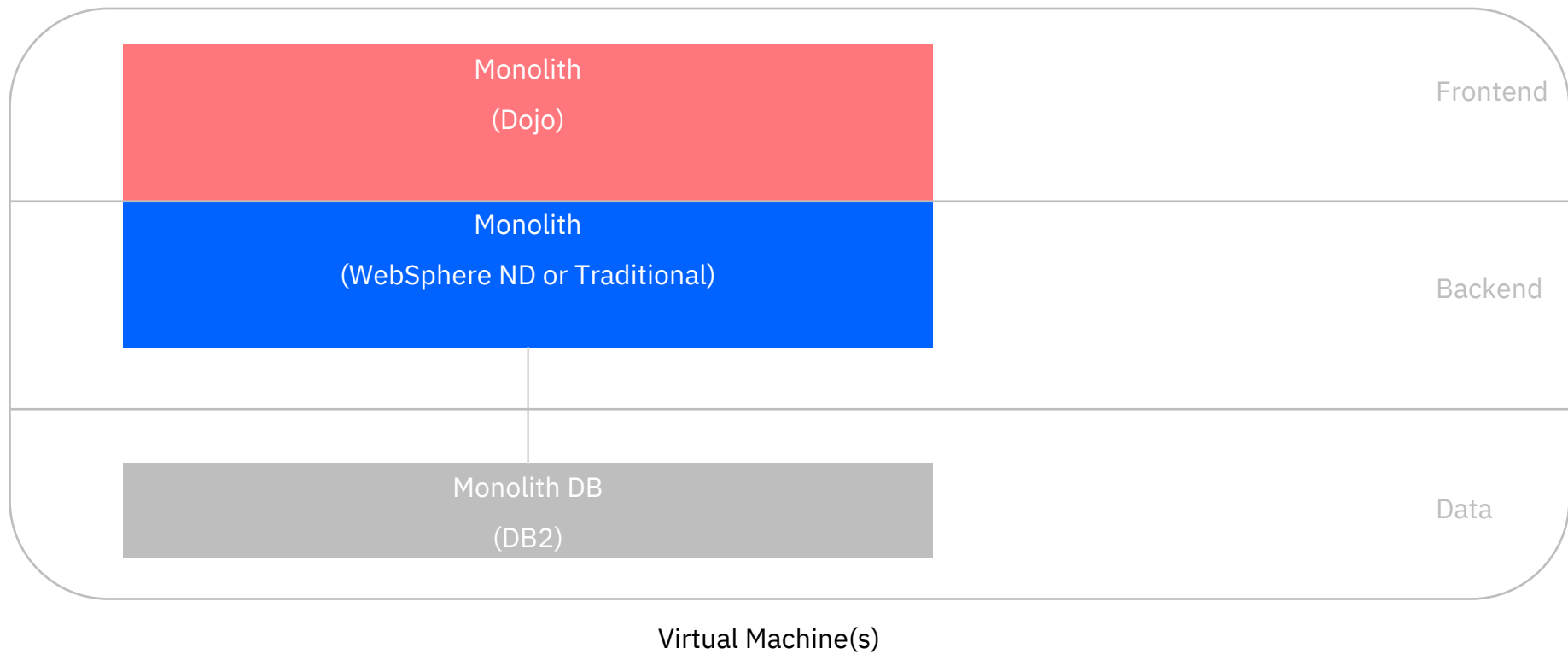
Application Modernization – End-to-End Example

From Java EE in 2008 to Quarkus in 2021

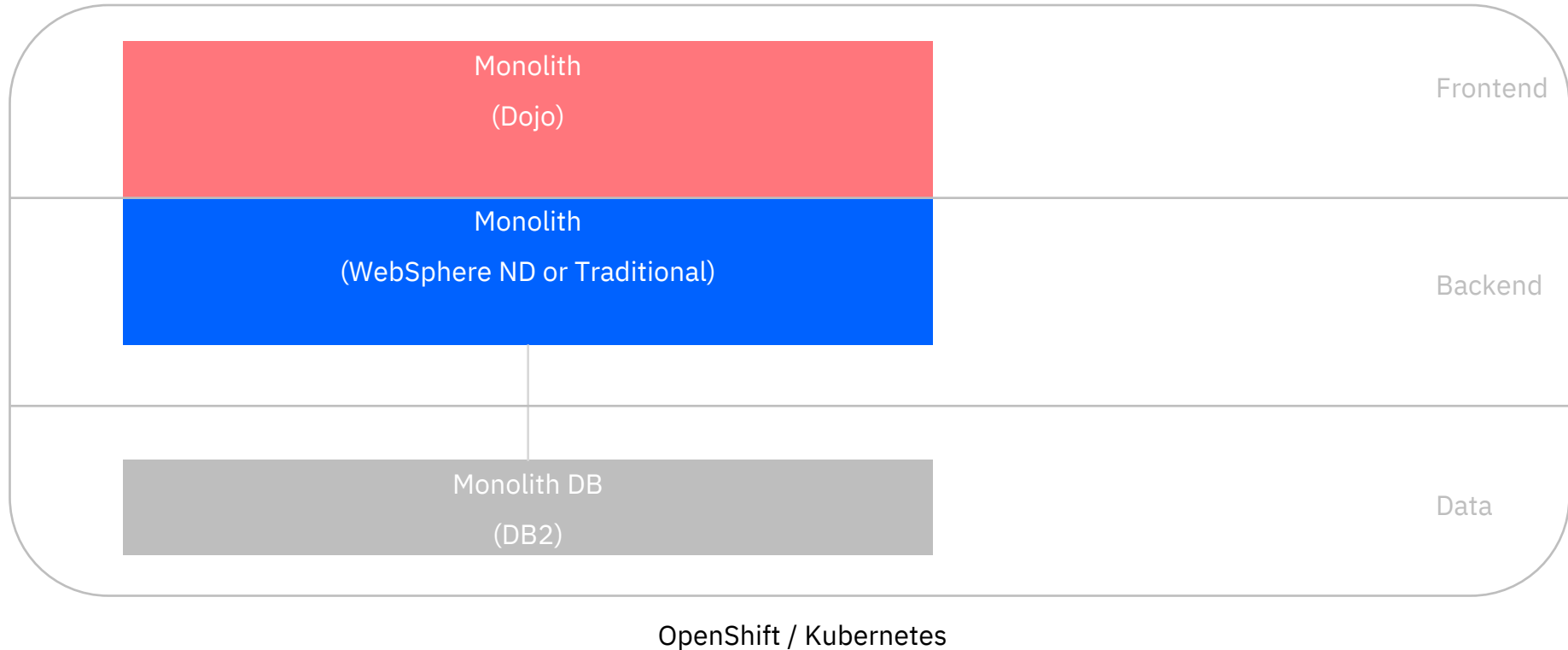
Niklas Heidloff
Developer Advocate, IBM
@nheidloff

Draft only
Work in progress ...

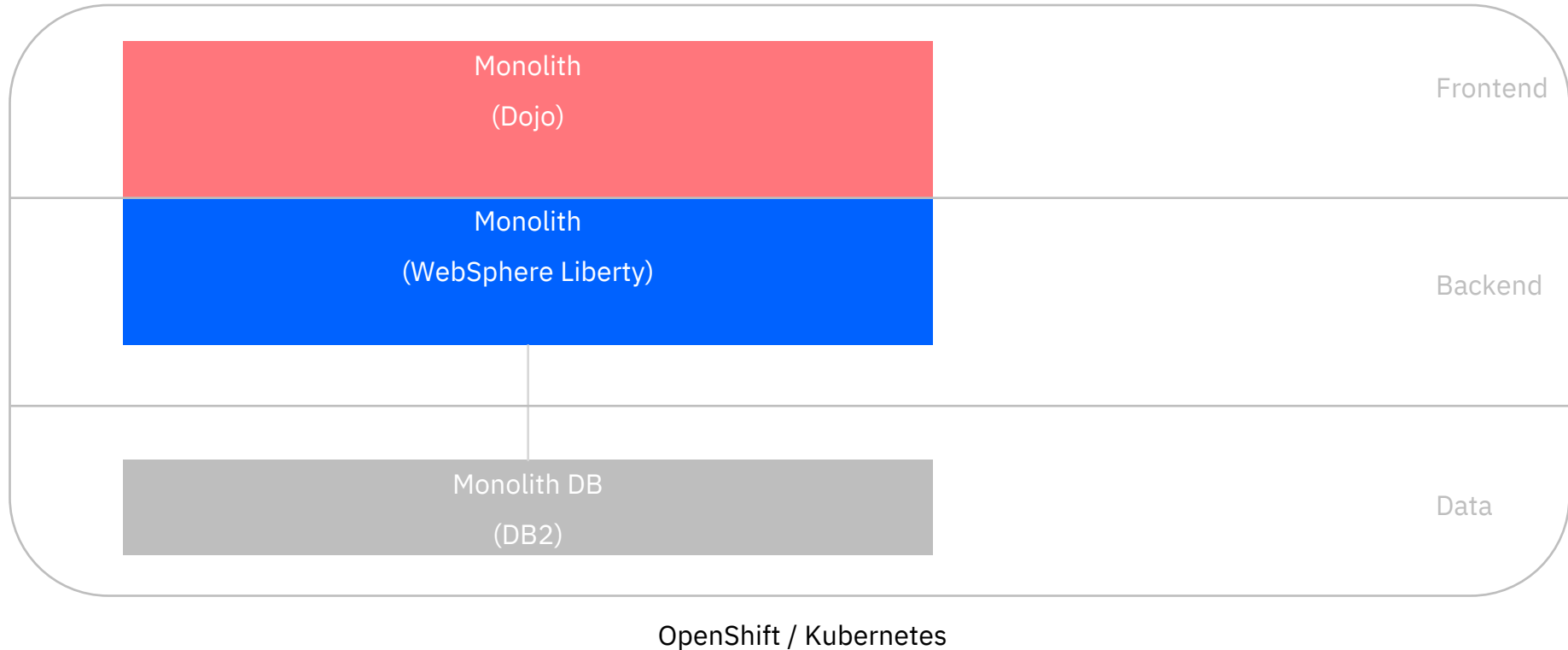
Step 1 / Starting Point: Monolith running in VM(s)



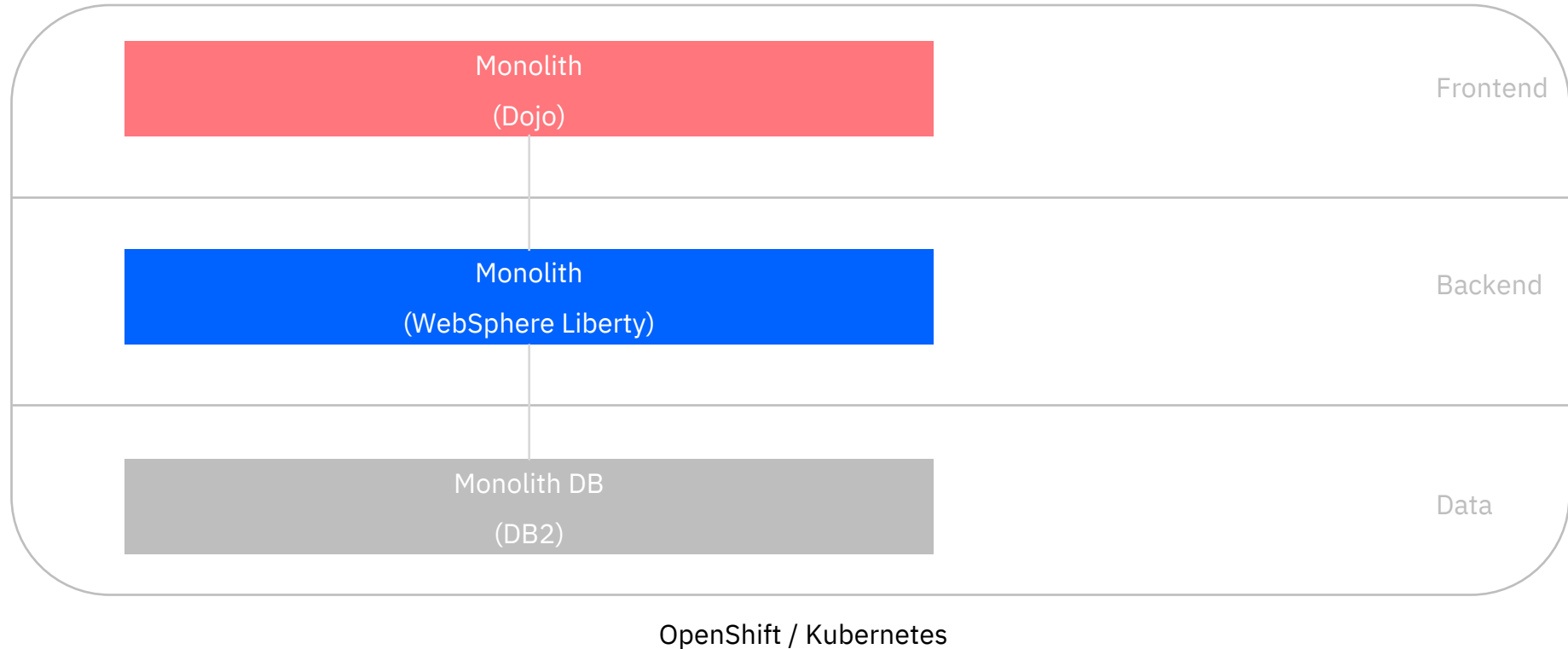
Step 2: Monolith running in Container on WebSphere Traditional



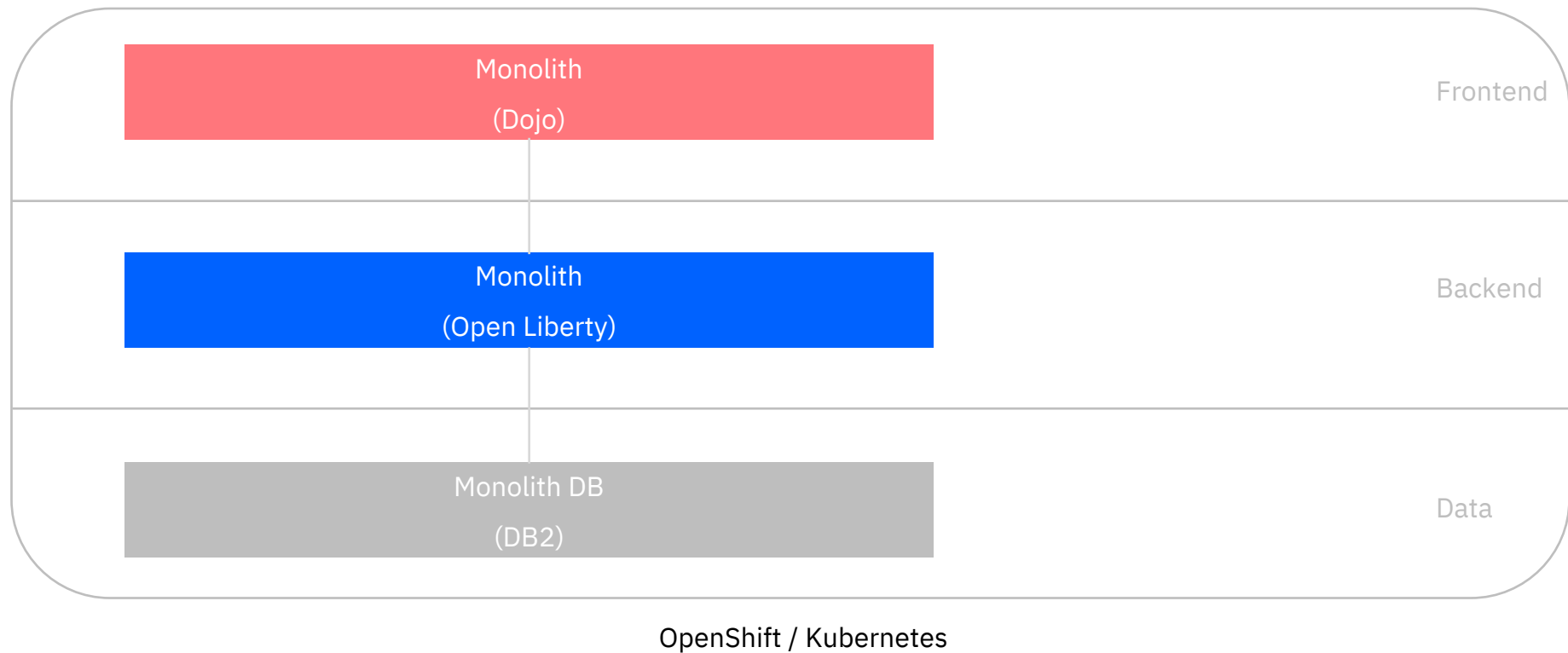
Step 3: Monolith running in Container on WebSphere Liberty



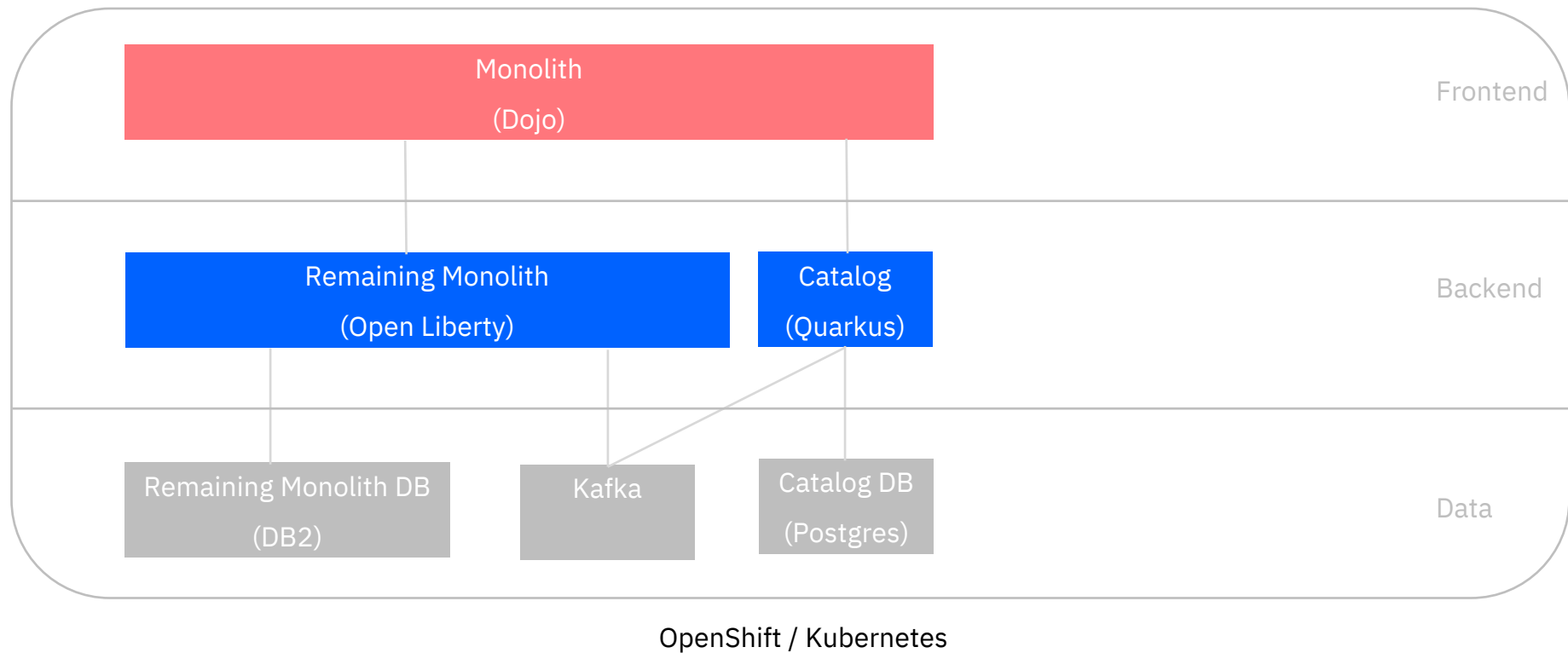
Step 4: Separated Frontend



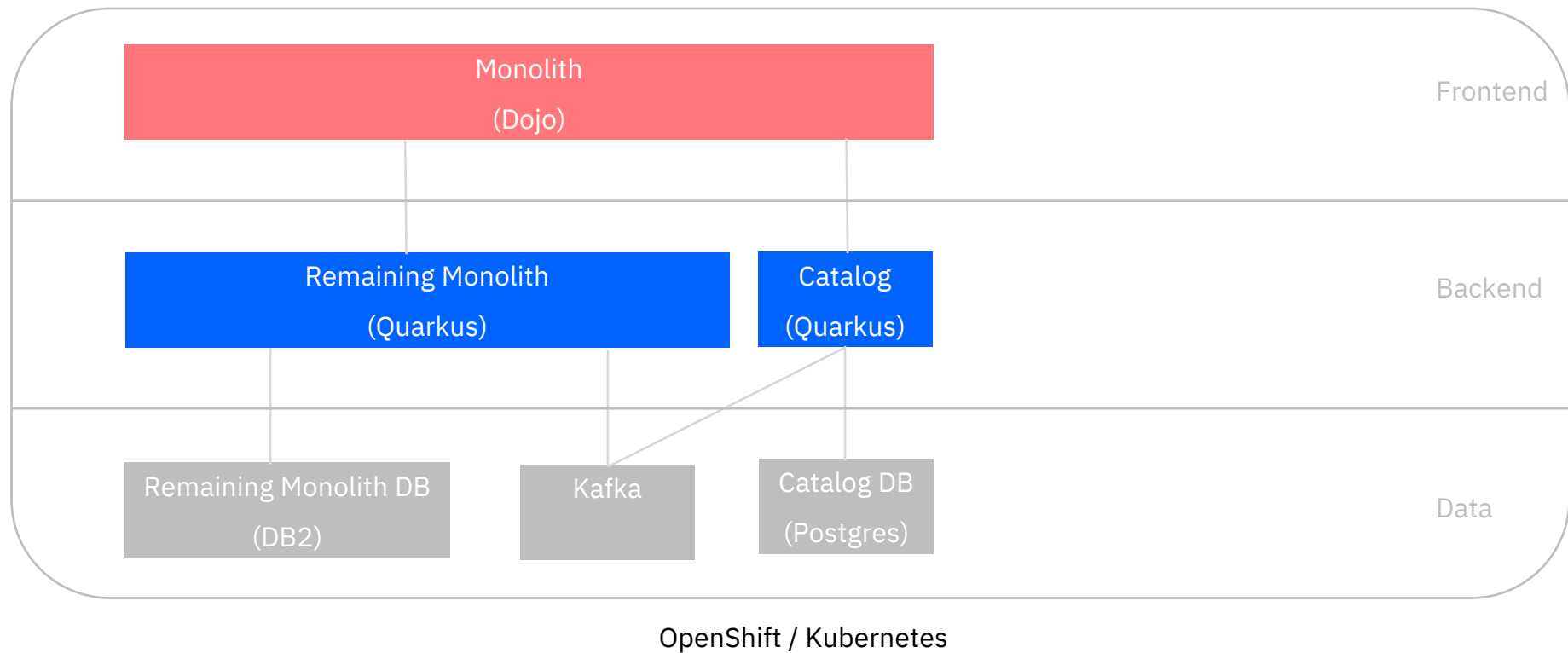
Step 5: Open Liberty Monolith



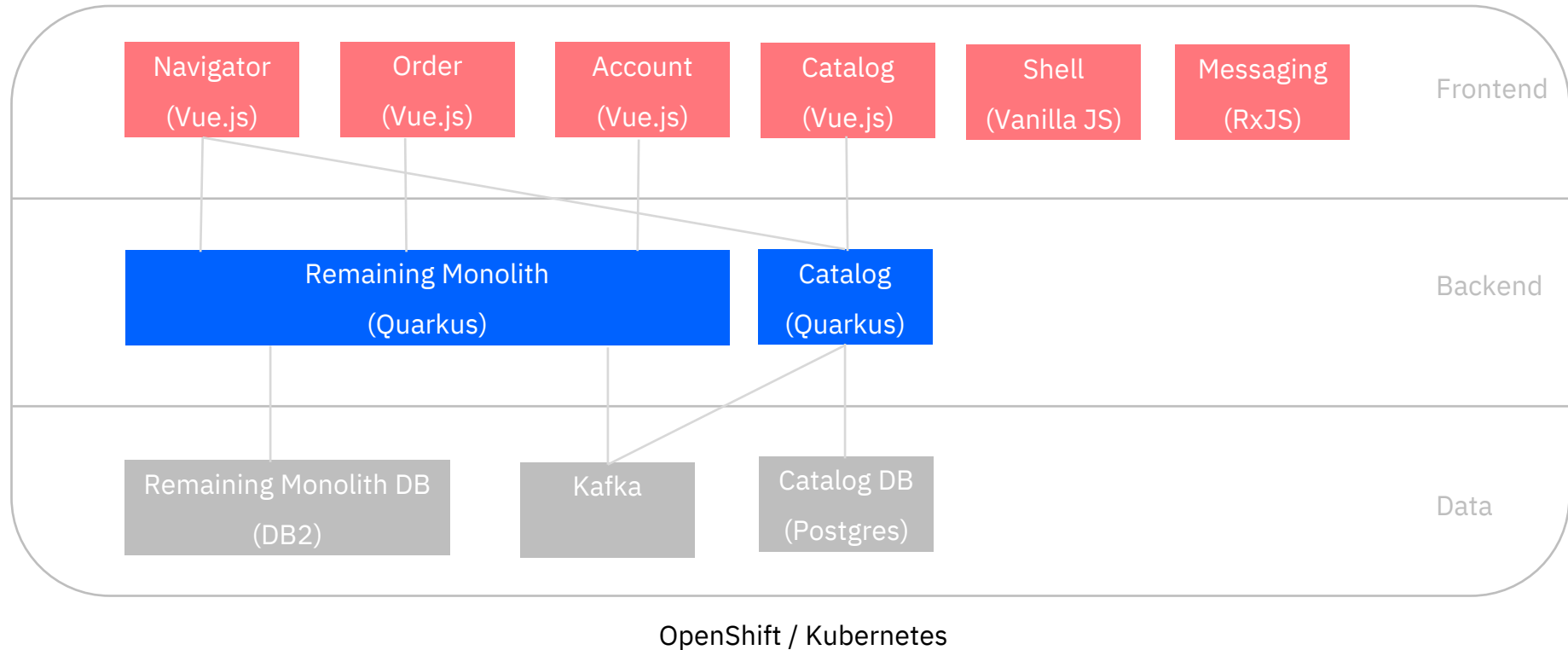
Step 6: Strangled Catalog Service and Open Liberty Monolith



Step 7: Strangled Catalog Service and Quarkus Monolith



Step 8: Quarkus Backend and Micro Frontends



Micro Frontends via single-spa

Shell
(Vanilla JS)


Messaging
(RxJS)

Electronic and Movie Depot

 Catalog

Entertainment

 Movies

 Music

 Games

Electronics

 TV

 Cellphones

Navigator
(Vue.js)



Shopping



Account

Catalog - Movies

Star Wars

Episode VI:
Return of the Jedi

Return of the Jedi

Episode 6, Luke has the final confrontation with his fa...

29.99

Star Wars

Episode V:
The Empire Strikes Back

Empire Strikes Back

Episode 5, Luke finds out a secret that will change hi...

29.99

Star Wars

Episode IV:
A New Hope

New Hope

Episode 4, after years of oppression, a band of rebels...

29.99

Catalog
(Vue.js)

Order
(Vue.js)

Account
(Vue.js)

Micro Frontends via single-spa

Navigator
(Vue.js)

Catalog
(Vue.js)

Order
(Vue.js)

Account
(Vue.js)

Shell
(Vanilla JS)

```
import { registerApplication, start } from "single-spa";

registerApplication({
  name: "@vue-app-mod/navigator",
  app: () => System.import("@vue-app-mod/navigator"),
  activeWhen: ["/"],
});

registerApplication({
  name: "@vue-app-mod/order",
  app: () => System.import("@vue-app-mod/order"),
  activeWhen: ["/", "/catalog", "/order"],
});

registerApplication({
  name: "@vue-app-mod/account",
  app: () => System.import("@vue-app-mod/account"),
  activeWhen: ["/account"],
});

registerApplication({
  name: "@vue-app-mod/catalog",
  app: () => System.import("@vue-app-mod/catalog"),
  activeWhen: ["/", "/catalog"],
});

|
start();
```

Messaging
(RxJS)

```
export default {
  ...
  getObservable(microFrontendName) {
    switch (microFrontendName) {
      case MICRO_FRONTEND_NAVIGATOR:
        if (!observableForNavigator) {
          observableForNavigator = new Subject()
        }
        return observableForNavigator
      ...
    }
  },
  send(message) {
    let topic = message.topic
    let commandId = message.commandId

    switch (topic) {
      case TOPIC_COMMAND_ADD_ITEM:
        if (observableForOrder) {
          observableForOrder.next(message)
        }
        break
      ...
    }
  }
}
```

Micro Frontends via single-spa

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta name="importmap-type" content="systemjs-importmap" />
  <script type="systemjs-importmap">
    {
      "imports": {
        "single-spa": "https://cdn.jsdelivr.net/npm/single-spa@5.1.1/lib/system/single-spa.min.js",
        "vue": "https://cdn.jsdelivr.net/npm/vue@2.6.11/dist/vue.min.js",
        "vue-router": "https://cdn.jsdelivr.net/npm/vue-router@3.1.6/dist/vue-router.min.js",
        "rxjs": "http://cdnjs.cloudflare.com/ajax/libs/rxjs/6.6.3/rxjs.umd.min.js",

        "@vue-app-mod/shell": "http://localhost:8080/vue-app-mod-shell.js",
        "@vue-app-mod/messaging": "http://localhost:9001/vue-app-mod-messaging.js",
        "@vue-app-mod/navigator": "http://localhost:8501/js/app.js",
        "@vue-app-mod/order": "http://localhost:8504/js/app.js",
        "@vue-app-mod/catalog": "http://localhost:8503/js/app.js",
        "@vue-app-mod/account": "http://localhost:8502/js/app.js"
      }
    }
  </script>
  <script src="https://cdn.jsdelivr.net/npm/import-map-overrides/dist/import-map-overrides.js"></script>
  <script src="https://cdn.jsdelivr.net/npm/systemjs/dist/system.js"></script>
  <script src="https://cdn.jsdelivr.net/npm/systemjs/dist/extras/amd.js"></script>
  <script src="https://cdn.jsdelivr.net/npm/systemjs/dist/extras/named-exports.js"></script>
  <link href="https://unpkg.com/material-components-web@latest/dist/material-components-web.min.css" rel="stylesheet">
  <script src="https://unpkg.com/material-components-web@latest/dist/material-components-web.min.js"></script>
  <link rel="stylesheet" href="https://fonts.googleapis.com/icon?family=Material+Icons">
</head>
<body>
  <div style="display: flex;flex-direction: row;">
    <div id="navigator" style="order: 1;flex-grow: 2;max-width: 300px;width:300px"></div>
    <div id="catalog" style="order: 2; flex-grow: 10;left: 320px;position: fixed;"></div>
    <div id="order" style="order: 2; flex-grow: 10;left: 320px;position: fixed;"></div>
    <div id="account" style="order: 2; flex-grow: 10;left: 320px;position: fixed;"></div>
  </div>
  <script>
    System.import('@vue-app-mod/shell');
  </script>
  <import-map-overrides-full show-when-local-storage="devtools" dev-libs></import-map-overrides-full>
</body>
</html>
```

Catalog - Movies

Entertainment

Movies

Music

Games

Electronics

TV

Cellphones

Star Wars

Return of the Jedi

Episode 6, Luke has the final confrontation with his fa... 29.99

Star Wars

Empire Strikes Back

Episode 5, Luke finds out a secret that will change hi... 29.99

Apprentice, a band of rebels... 29.99

ADD TO SHOPPING CART

override. See documentation for more info.

Search modules Add new module Add import map Reset all overrides

@vue-app-mod/navigator

Default URL: http://localhost:8501/js/app.js

Override URL:

Cancel

Reset to default

Module Status	Module Name	Domain	Filename
Inline Override	single-spa	cdn.jsdelivr.net	single-spa.dev.js
Inline Override	vue	cdn.jsdelivr.net	vue.js
Inline Override	vue-router	cdn.jsdelivr.net	vue-router.js
Default	rxjs	cdnjs.cloudflare.com	rxjs.umd.min.js
Default	@vue-app-mod/shell	localhost:8080	vue-app-mod-shell.js
Default	@vue-app-mod/messaging	localhost:9001	vue-app-mod-messaging.js
Default	@vue-app-mod/navigator	localhost:8501	app.js

Elements Console Sources Network Performance Memory >> X

Preserve log Disable cache Online

Filter Hide data URLs All XHR JS CSS Img Media Font Doc WS Manifest Other

Has blocked cookies Blocked Requests

50 ms 100 ms 150 ms 200 ms 250 ms

Name	S...	Domain	Type	Initiator	Size	T...	Waterfall
catalog	304	localhost	docu...	Other	431 B	6...	
import-map-overrides.js	200	cdn.jsdelivr...	script	catalog	(mem...	0...	
system.js	200	cdn.jsdelivr...	script	catalog	(mem...	0...	
amd.js	200	cdn.jsdelivr...	script	catalog	(mem...	0...	
named-exports.js	200	cdn.jsdelivr...	script	catalog	(mem...	0...	
material-components-web.mi...	302	unpkg.com	styles...	catalog	70 B	3...	
material-components-web.mi...	302	unpkg.com	script...	catalog	94 B	2...	
icon?family=Material+Icons	200	fonts.go...	styles...	catalog	(disk ...	2...	
material-components-web.mi...	200	unpkg.com	script	material-co...	(disk ...	2...	
material-components-web.mi...	200	unpkg.com	styles...	material-co...	(disk ...	3...	
vue-app-mod-shell.js	200	localhost	script	system.js:654	(disk ...	1...	
fIUhRq6tzZciQEJ-Vdg-luiaDs...	200	fonts.gst...	font	icon?family...	(mem...	0...	
single-spa.min.js	200	cdn.jsdelivr...	script	system.js:654	(disk ...	1...	
app.js	200	localhost	script	system.js:654	(disk ...	9...	
app.js	200	localhost	script	system.js:654	(disk ...	2...	
app.js	200	localhost	script	system.js:654	(disk ...	3...	
vue-router.min.js	200	cdn.jsdelivr...	script	system.js:654	(disk ...	1...	
vue.min.js	200	cdn.jsdelivr...	script	system.js:654	(disk ...	3...	
vue-app-mod-messaging.js	200	localhost	script	system.js:654	(disk ...	3...	
?categoryId=2	200	localhost	fetch	Home.vue:1...	640 B	1...	
Category	200	localhost	fetch	App.vue:113	499 B	1...	
Orders	200	localhost	fetch	App.vue:82	550 B	1...	
Return.jpg	200	localhost	jpeg	vue_min.js:6	(mem...	0...	
Empire.jpg	200	localhost	jpeg	vue_min.js:6	(mem...	0...	
NewHope.jpg	200	localhost	jpeg	vue_min.js:6	(mem...	0...	

25 requests 2.3 kB transferred 2.0 MB resources Finish: 235 ms DOMContentLoaded: 80 ms Load: 230 ms

Micro Frontends – Messaging via RxJS for loosely Coupling

Command Pattern – Example: Add Item to Cart

Catalog -> Order	
messaging - messaging.js - send invoked - topic: TOPIC_COMMAND_ADD_ITEM	commandId: messaging.js:49
1611049822817	
▶ {__ob__: we}	messaging.js:50
order - App.vue - created - message:	App.vue:20
Topic: TOPIC_COMMAND_ADD_ITEM	App.vue:21
CommandId: 1611049822817	App.vue:22
ProductId: 1	App.vue:23
Product has been added to order	App.vue:47
Products in shopping cart: 1	App.vue:54
Line items in shopping cart: 2	App.vue:55
Order -> Navigator	
messaging - messaging.js - send invoked - topic: TOPIC_EVENT_AMOUNT_LINE_ITEMS_CHANGED	commandId: undefined
1611049822817	messaging.js:49
▶ {topic: "TOPIC_EVENT_AMOUNT_LINE_ITEMS_CHANGED", payload: {...}}	messaging.js:50
navigator - App.vue - amountLineItems: 2	App.vue:74
Order -> Catalog	
messaging - messaging.js - send invoked - topic: TOPIC_COMMAND_RESPONSE_ADD_ITEM	commandId: undefined
1611049822817	messaging.js:49
▶ {topic: "TOPIC_COMMAND_RESPONSE_ADD_ITEM", payload: {...}}	messaging.js:50
catalog - Home.vue - message:	Home.vue:69

Appendix

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IBM