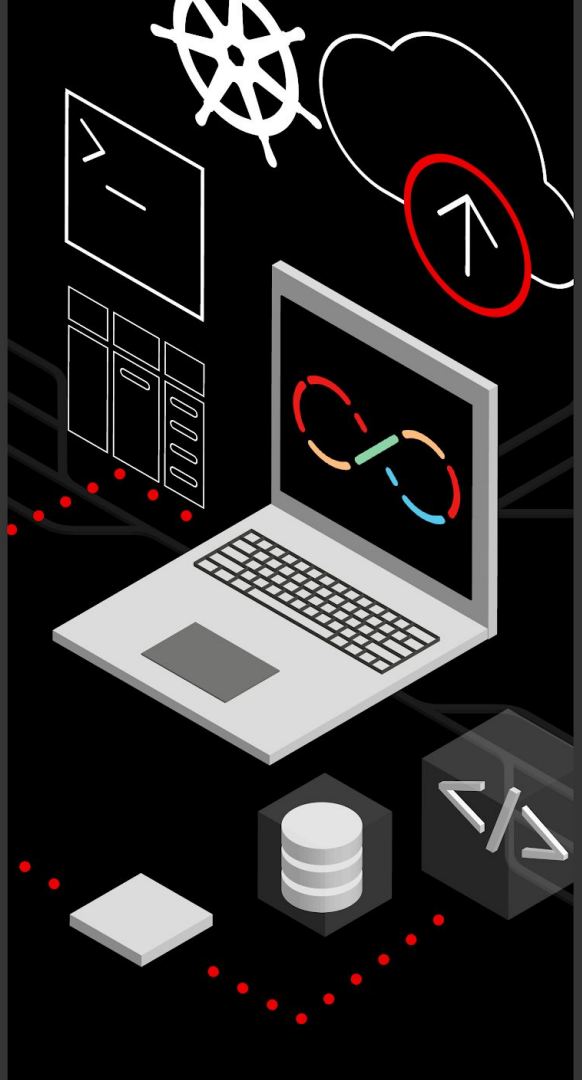


Would You Like Fries with That?

AI for Developer Productivity

Kyra Goud
Specialist Solution Architect

Josephine Pfeiffer
Cloud Native Consultant

Red Hat

Today’s Menu

- Problem statement: why would we want this in the first place?
- Deepdive: getting interesting data out of backstage
- Deepdive: doing interesting things with this data
- Learnings & outlook
- Q&A time!

Developers are under pressure: And their productivity is slowing down.

Organizations are looking for a platform to reduce toil and increase productivity.

39%

Increasing workload / demand from other teams lead to increased overhead.[1]

76%

More than three-quarters of organizations say the **cognitive load is so high that it is a source of low productivity.**[1]

37%

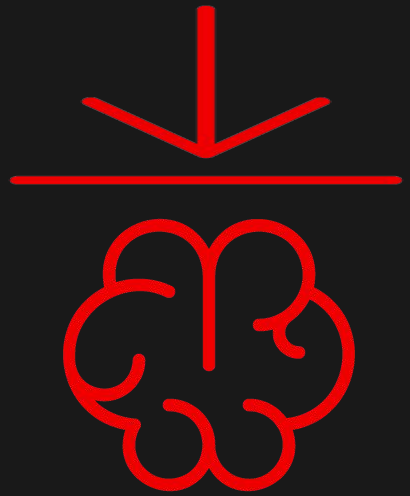
Adapting to the pressures of digital transformation is third biggest challenge.[1]

35%

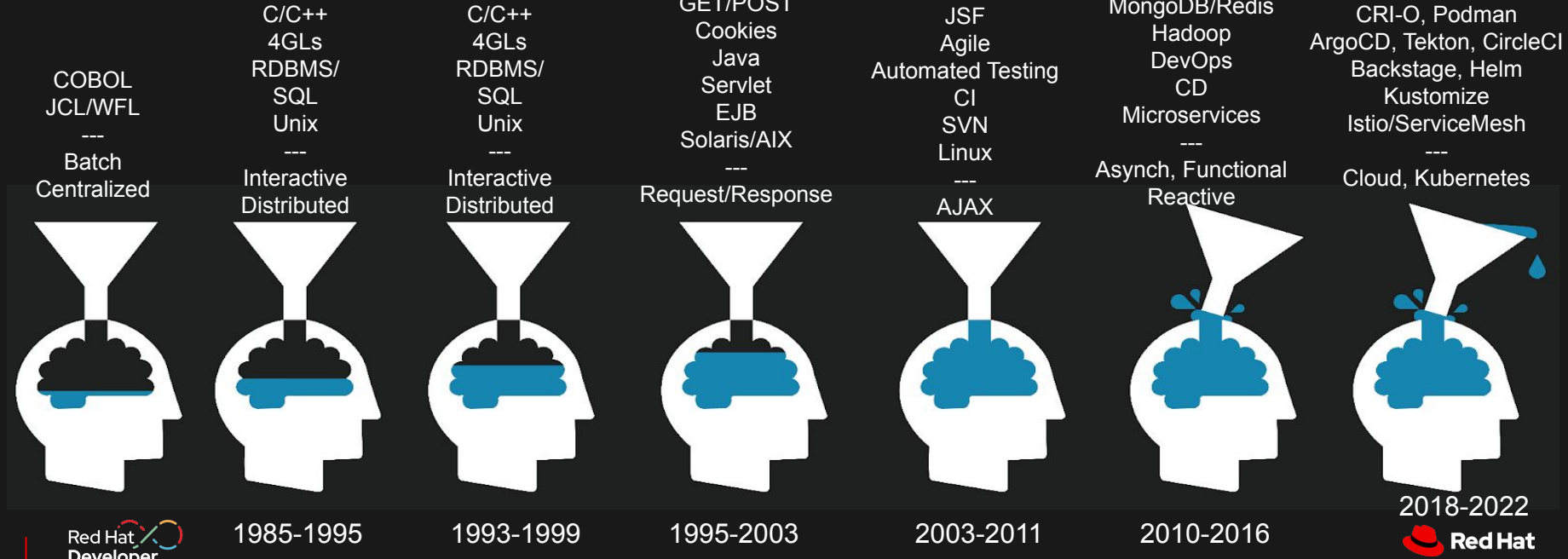
Learning skills to adapt to new technologies and approaches [1]

[1] Salesforce productivity survey

Cognitive Load



Overloaded!


COBOL
JCL/WFL

Batch
Centralized
C/C++
4GLs
RDBMS/
SQL
Unix

Interactive
Distributed
C/C++
4GLs
RDBMS/
SQL
Unix

Interactive
Distributed
HTML
HTTP
CGI
GET/POST
Cookies
Java
Servlet
EJB
Solaris/AIX

Request/Response
MVC-Struts
DI-Spring
ORM-Hibernate
XML
WS-*
JSF
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Automated Testing
CI
SVN
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HTML5 (JavaScript)
iOS/Android
Phonegap/Cordova
Cucumber
REST
Maven/Gradle
git
MongoDB/Redis
Hadoop
DevOps
CD
Microservices

Asynch, Functional
Reactive
Java EE 8-12, NodeJS, Go
Serverless
AWS, Azure
Flutter, Typescript
Kafka, GCP
gRPC, Avro
Vue, React, Next.js
Serverless, Wasm
Terraform, Vault
CRI-O, Podman
ArgoCD, Tekton, CircleCI
Backstage, Helm
Kustomize
Istio/ServiceMesh

Cloud, Kubernetes
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1985-1995
1993-1999
1995-2003
2003-2011
2010-2016
2018-2022
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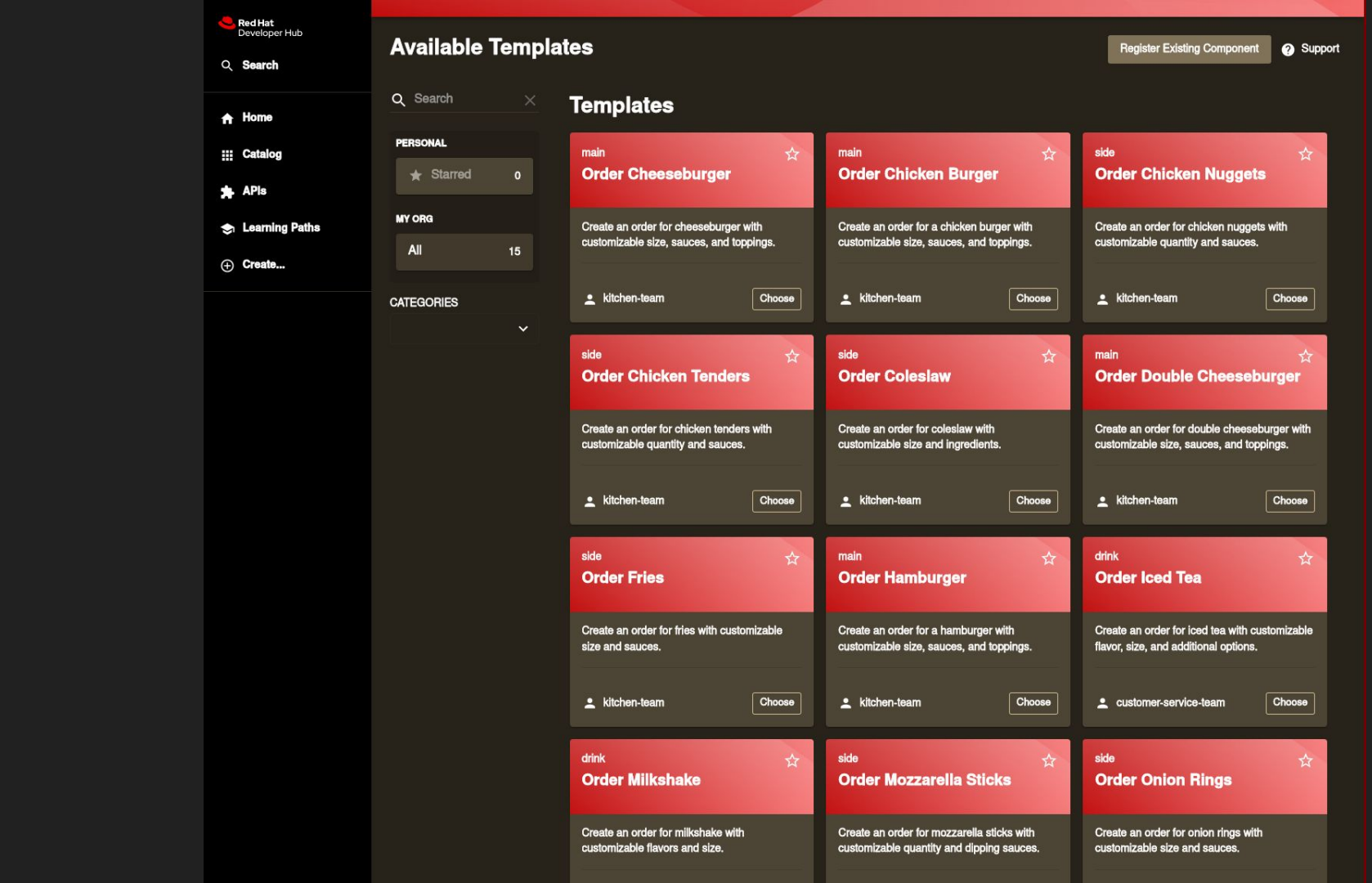
As the enterprise adopts an IDP and scales, finding what is relevant to you becomes harder to actually find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Learning Paths
Create...
Available Templates
Register Existing Component
Support
Search
PERSONAL
Starred 0
MY ORG
All 15
CATEGORIES
Templates
main
Order Cheeseburger
Create an order for cheeseburger with customizable size, sauces, and toppings.
kitchen-team
Choose
main
Order Chicken Burger
Create an order for a chicken burger with customizable size, sauces, and toppings.
kitchen-team
Choose
side
Order Chicken Nuggets
Create an order for chicken nuggets with customizable quantity and sauces.
kitchen-team
Choose
side
Order Chicken Tenders
Create an order for chicken tenders with customizable quantity and sauces.
kitchen-team
Choose
side
Order Coleslaw
Create an order for coleslaw with customizable size and ingredients.
kitchen-team
Choose
main
Order Double Cheeseburger
Create an order for double cheeseburger with customizable size, sauces, and toppings.
kitchen-team
Choose
side
Order Fries
Create an order for fries with customizable size and sauces.
kitchen-team
Choose
main
Order Hamburger
Create an order for a hamburger with customizable size, sauces, and toppings.
kitchen-team
Choose
drink
Order Iced Tea
Create an order for iced tea with customizable flavor, size, and additional options.
customer-service-team
Choose
drink
Order Milkshake
Create an order for milkshake with customizable flavors and size.
side
Order Mozzarella Sticks
Create an order for mozzarella sticks with customizable quantity and dipping sauces.
side
Order Onion Rings
Create an order for onion rings with customizable size and sauces.

“Would you like fries with that?”

Red Hat Developer

https://woman.thenest.com/average-annual-salary-fast-food-worker-16306.html

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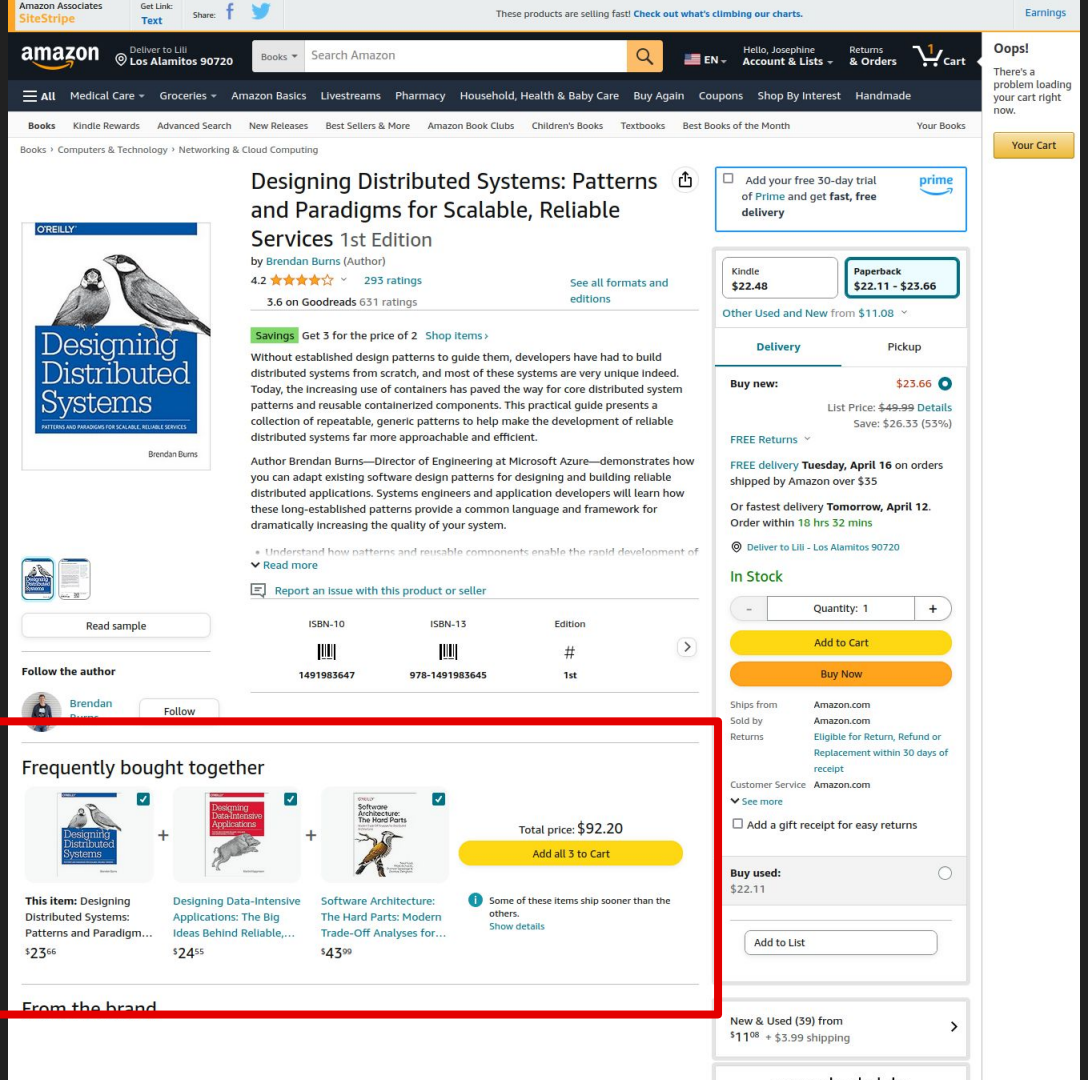
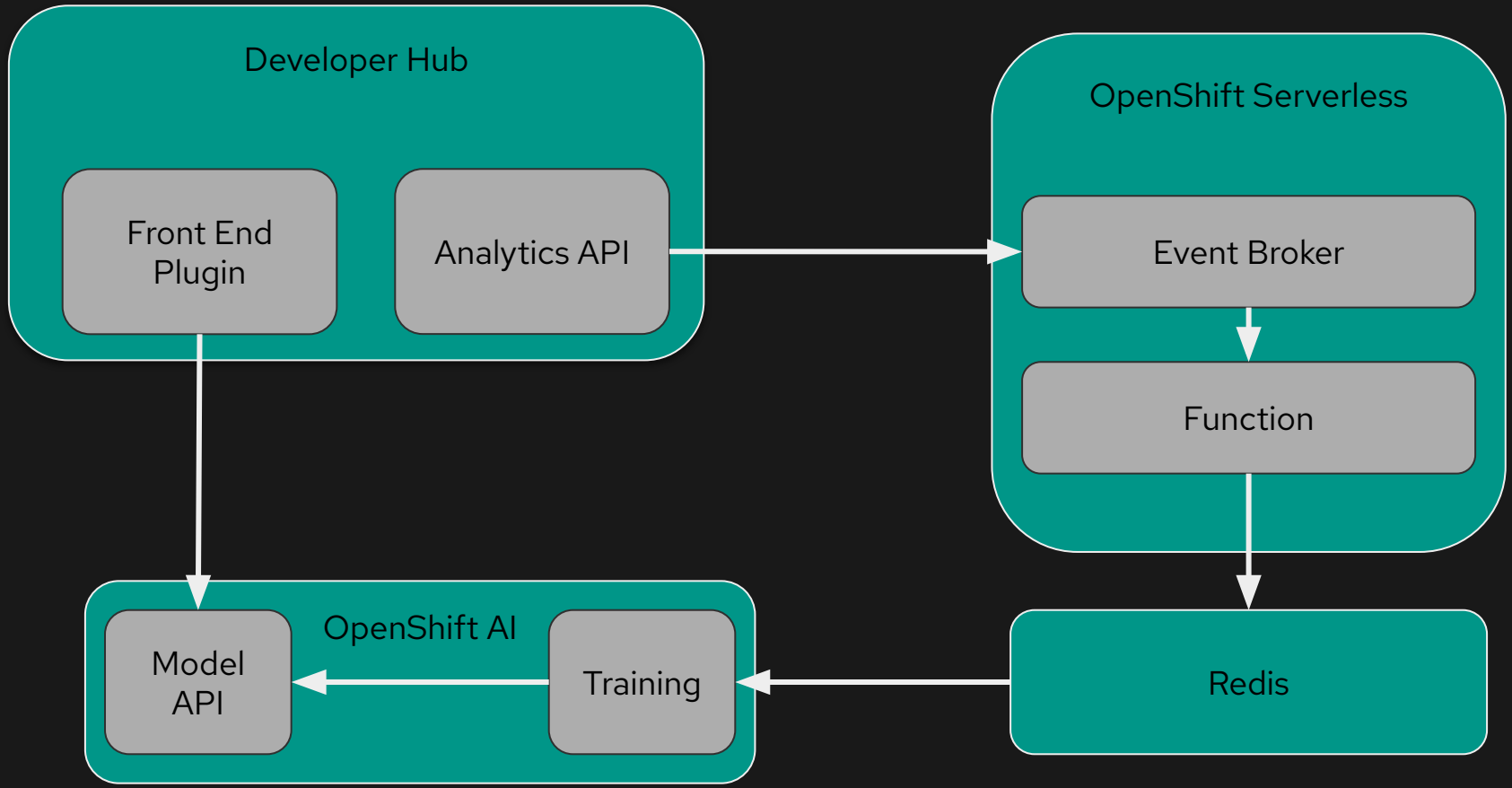
Amazon famously does this too

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Front End Plugin
Analytics API
OpenShift Serverless
Event Broker
Function
OpenShift AI
Model API
Training
Redis

Red Hat Developer Hub

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Explore

Create...

Tech Radar

Lighthouse

Cost Insights

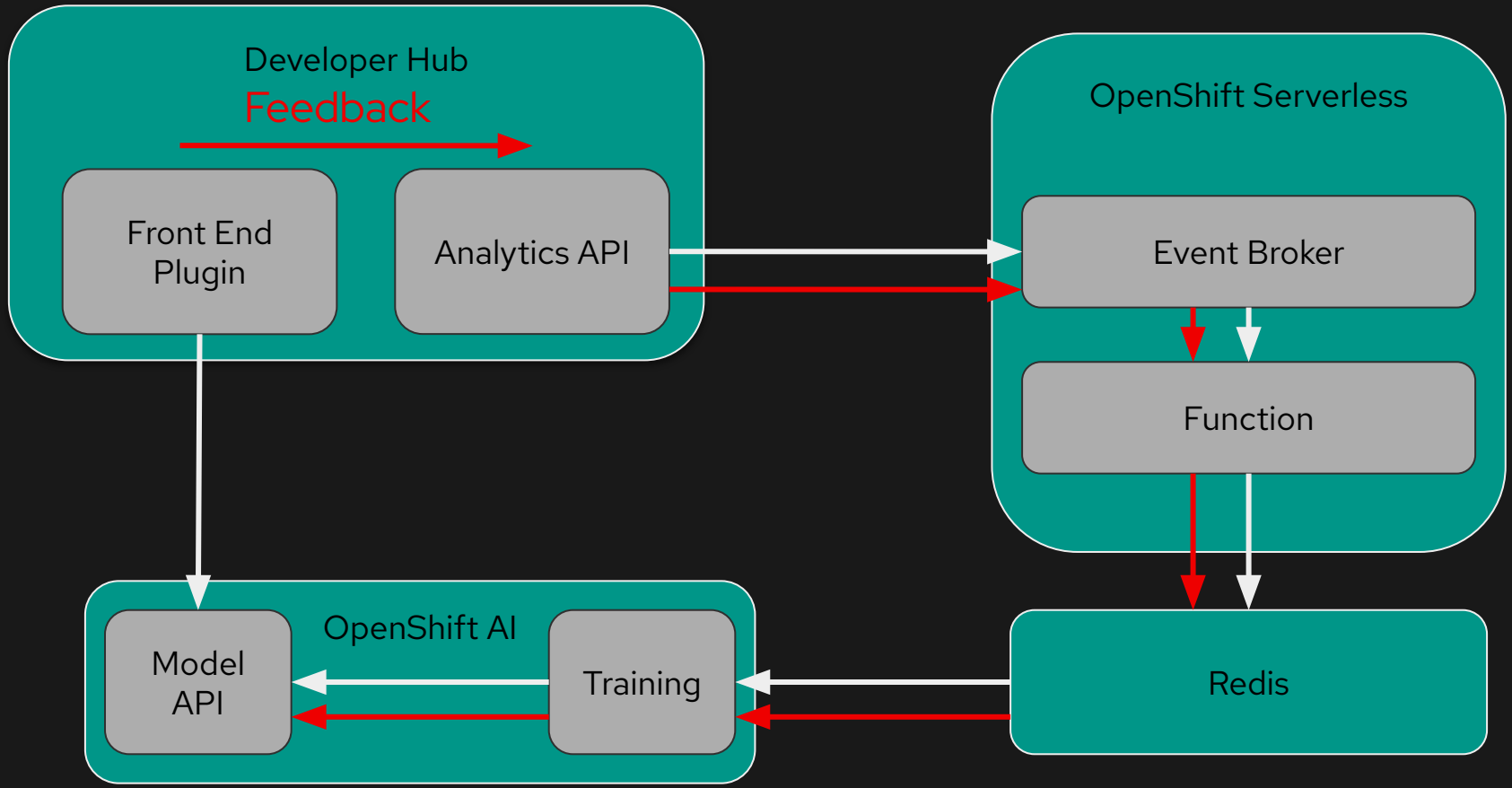
Score board

Add Shortcuts

Re Recommended

Recommended Templates

Title	Description	Tags	Owner	Feedback
Order Fries	Create an order for fries with customizable size and sauces.	side	kitchen-team	
Order Milkshake	Create an order for milkshake with customizable flavors and si…	drink	customer-service-team	
Order Cheeseburger	Create an order for cheeseburger with customizable size, sau…	main	kitchen-team	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Feedback
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Analytics API
OpenShift Serverless
Event Broker
Function
OpenShift AI
Model API
Training
Redis

The infrastructure

Ingredients:

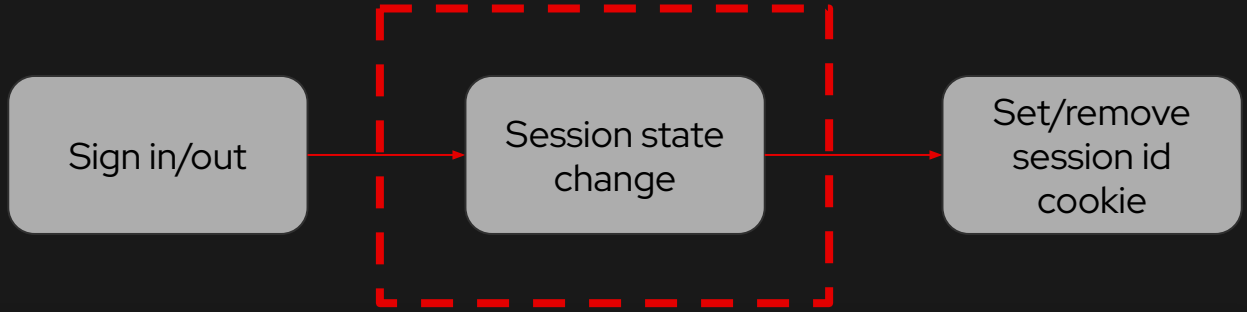
- Setup 100% self-contained in one cluster
- Helm charts & argo :)
- GitHub actions to build container images, npm packages and publish charts

Creating the generic analytics plugin

The recipe:

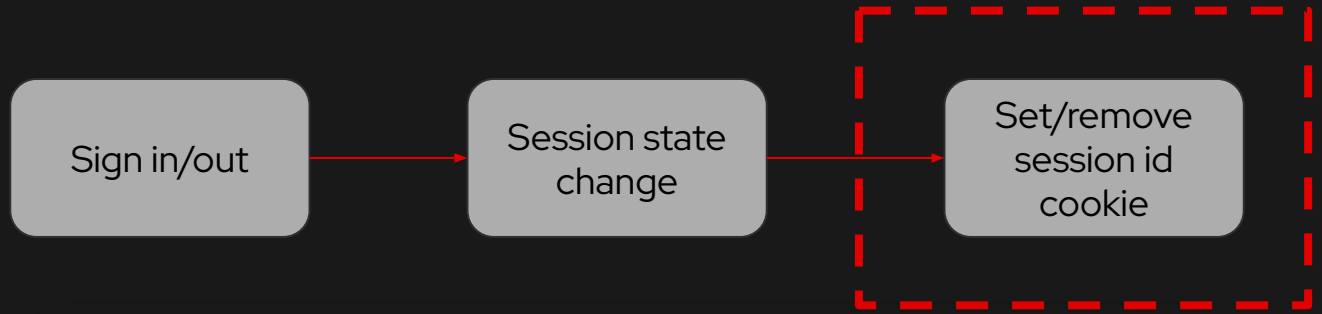
- Subscribe to session state
- Event logging API
- Metadata to enhance events
- Forward logs to endpoint

Session IDs



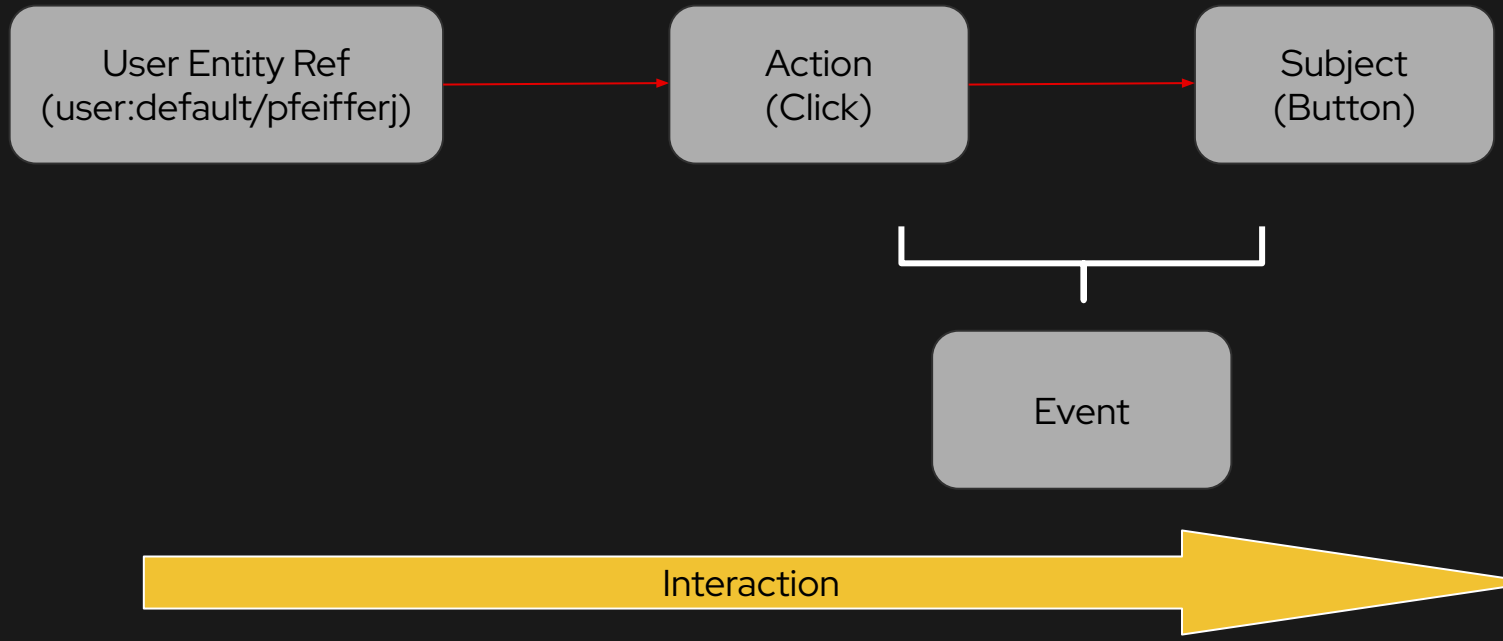

```
try {
    this.sessionApi.sessionState$().subscribe(this.handleSessionStateChange);
    ...
```

Session IDs



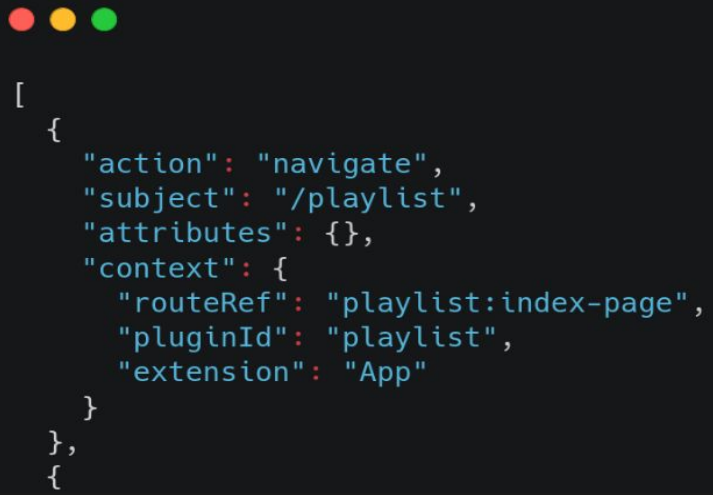

```
private handleSessionStateChange = (sessionState: SessionState) => {
  ...
  if (sessionState === SessionState.SignedIn) {
    ...
    document.cookie = `sessionId=${this.sessionId}; path=/`;
    ...
```

Analytics Events



Example Event

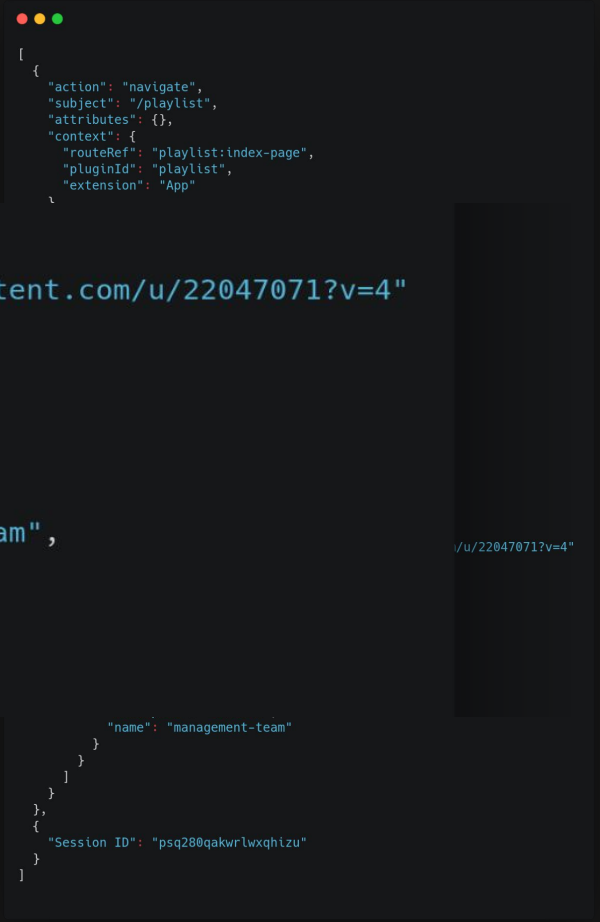

```
[
  {
    "action": "navigate",
    "subject": "/playlist",
    "attributes": {},
    "context": {
      "routeRef": "playlist:index-page",
      "pluginId": "playlist",
      "extension": "App"
    }
  },
  {
    "User ID": "user:default/pfeifferj"
  },
  {
    "Team Metadata": {
      "metadata": {
        "namespace": "default",
        "annotations": {
          ...
        },
        "name": "pfeifferj",
        ...
      },
      "apiVersion": "backstage.io/v1alpha1",
      "kind": "User",
      "spec": {
        "profile": {
          "displayName": "Josephine Pfeiffer",
          "email": "josie@redhat.com",
          "picture": "https://avatars.githubusercontent.com/u/22047071?v=4"
        },
        "memberOf": ["management-team"]
      },
      "relations": [
        {
          "type": "memberOf",
          "targetRef": "group:default/management-team",
          "target": {
            "kind": "group",
            "namespace": "default",
            "name": "management-team"
          }
        }
      ]
    }
  },
  {
    "Session ID": "psq280qakwrlwxqhizu"
  }
]
```



```
[
  {
    "action": "navigate",
    "subject": "/playlist",
    "attributes": {},
    "context": {
      "routeRef": "playlist:index-page",
      "pluginId": "playlist",
      "extension": "App"
    }
  },
  {
```

```
[
  {
    "action": "navigate",
    "subject": "/playlist",
    "attributes": {},
    "context": {
      "routeRef": "playlist:index-page",
      "pluginId": "playlist",
      "extension": "App"
    }
          }
        }
      ]
    }
  },
  {
    "Session ID": "psq280qakwrlwxqhizu"
  }
]
```

```
  },
  {
    "User ID": "user:default/pfeifferj"
  },
  {
```



```
[
  {
    "action": "navigate",
    "subject": "/playlist",
    "attributes": {},
    "context": {
      "routeRef": "playlist:index-page",
      "pluginId": "playlist",
      "extension": "App"
    }
  },
  {
    "Session ID": "psq280qakwrlwxqhizu"
  }
]
```

```
    "displayName": "Josephine Pfeiffer",
    "email": "josie@redhat.com",
    "picture": "https://avatars.githubusercontent.com/u/22047071?v=4"
  },
  "memberOf": ["management-team"]
},
"relations": [
  {
    "type": "memberOf",
    "targetRef": "group:default/management-team",
    "target": {
      "kind": "group",
      "namespace": "default",
      "name": "management-team"
    }
```

```
  },
  {
    "Session ID": "psq280qakwrlwxqhizu"
  }
]
```

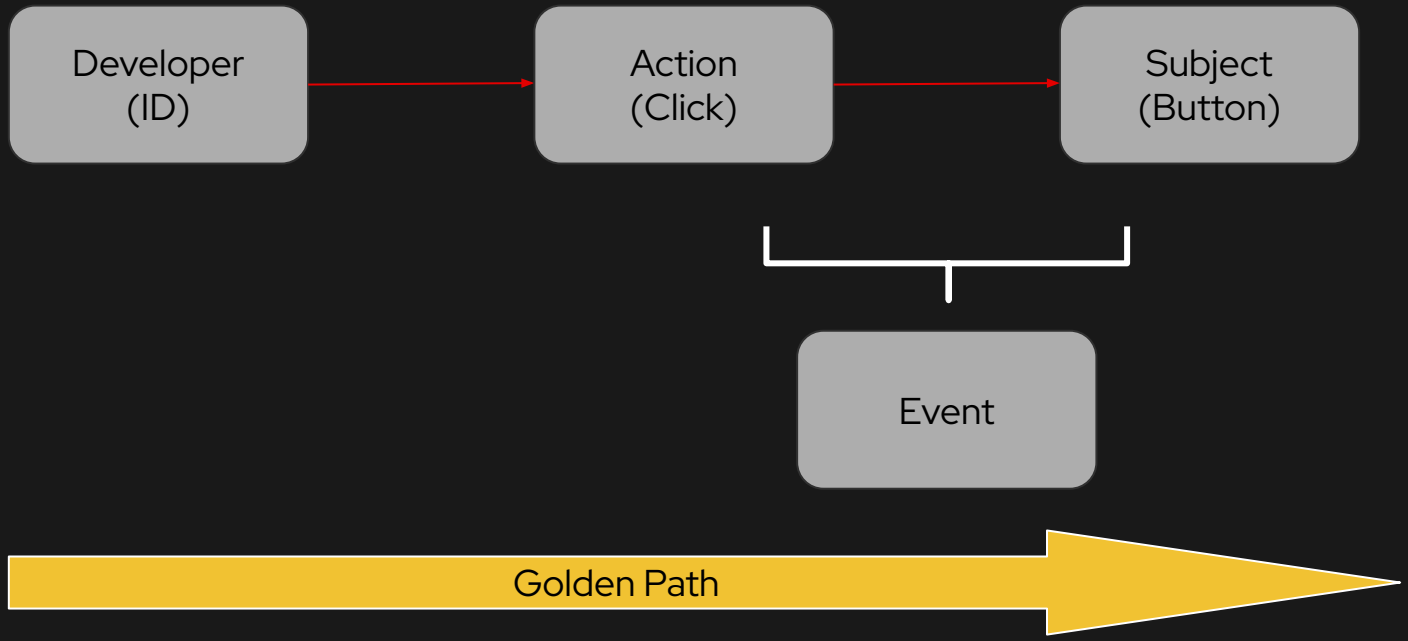
The Predictive Mechanism

What are we predicting?

If a customer orders fries, what is the most likely thing they will order next?

If a developer chooses this template, what is the most likely thing they will add? - How can we help?

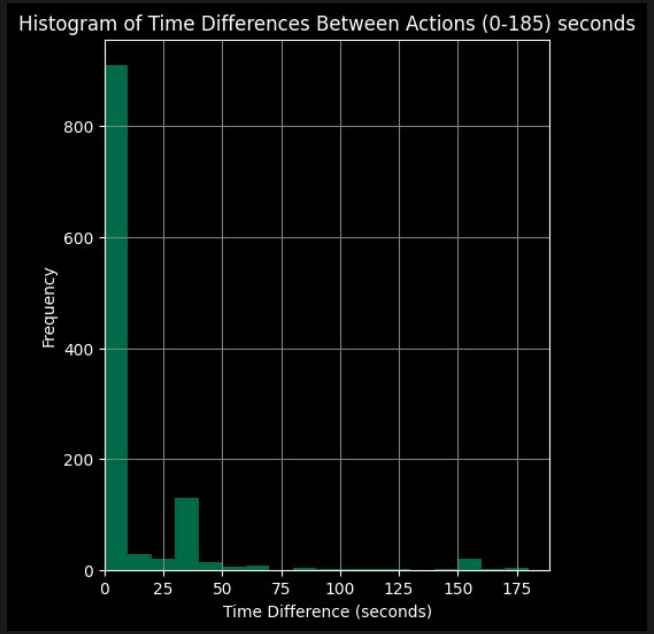
Method


Developer
(ID)
Action
(Click)
Subject
(Button)
Event
Golden Path

EDA

What numbers are we munching?

- 7 Users with different permissions
- 1250 logged Interactions
- 51 Chains of interactions
- 65 Event (action + subject) Combinations
- Modeled after 12 “Golden Paths”
- Training Data & Spontaneous user interactions



What’s on the menu?

- LSTM
- Hidden Markov Models
- Large Language Models (Fries?)
- Findings and Future Outlook

LSTM

Long Term Short Term Memory

- Advantageous when using a sequential input
- Good at capturing patterns in user behaviour- on Wednesdays more people order takeaway

Food Inspection:

- **Good**: Capturing Long Range Dependencies and Patterns
- **Bad:** Hard to interpret - Hard to explain the outcomes of a black box

Hidden Markov Model

- **Known State**: Customer wants to order a Burger without Cheese
- **Unknown State:** Customer is Lactose intolerant
- **Known State**: User Creates a Database on a K8 Cluster
- **Unknown State**: User wants to make his own scalable Web App Backend

Food Inspection:

- **Good to use when** - Few Manageable States
- **Do not use when** - Understanding more complex behaviour

Conclusion

- **LSTM**: complex, data-rich environments where capturing long-term dependencies and learning directly from data is crucial. Best for scenarios where customer behavior is dynamic and less predictable.
- **HMM**: Simple, interpretable model with limited data and clearly defined states. Sequence modelling with a reasonable number of states and known dependencies.

LLM

Proposal: Prompt the LLM with the current State & Suggest Options

Based on the given sequence of actions, it appears the user is exploring creation options and navigating through different sections of the catalog and creation areas. The next likely action could be:

'navigate_/create/templates/default/order-cheeseburger' or any other specific order creation template, as they have already been in the creation area and might proceed to create a specific item.

'click_explore' or 'navigate_/explore', if they continue to explore other available options.

Food Inspection:

Pros: Reasoning behind Options
Cons: Expensive Transactions , Many Queries, Context Length

Reworked: LLM

New Proposal:

Taking inspiration from Bioinformatics

- Using an LLM to convert action to natural language
- Using LLM to predict next action based on a natural language prompt - Give the final options

LLM Burger Prediction

Given that the user has ordered a **chicken burger with mayonnaise and ketchup, the next most likely selections would be**:

Medium Size - Since the user has chosen a specific combination of condiments (mayonnaise and ketchup), they may want a balanced portion.

Additional Sauces - It is less likely they would add another sauce, but if they do, barbecue or honey mustard might be considered to complement the existing sauces.
Topping choices by likelihood

- **Lettuce** - This is a common topping that pairs well with chicken burgers.
- **Tomato** - Often chosen with lettuce to create a classic combination.
- **Cheese** - Another popular choice to enhance the flavor profile.

Findings: Data Science

HMM - Hard to measure as previously unseen sequences appear. - Good if there are only few golden paths.

LSTM - After a while of training, results are at 60% accuracy for the validation set.

LLM - Good idea to add context and explanation - Unforeseen Hallucinations might happen. Further pursuing the LLM in Bioinformatics Approach!

Outlook:

- Add context

- Add real user data

Findings: Backstage/Infrastructure

Backstage docs - Not that great yet

Backstage Community - The maintainers are very helpful

GitOpsing everything - Takes an initial time investment but pays off 100x

Outlook:
- **Fine tune logging mechanisms**
- **Make options more configurable**
- **Add testing**

GitHub - Stay tuned...

github.com/pfeifferj/backstage-ai-demo

Q & A Time!

linkedin.com/showcase/red-hat-developer

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Backup Slides :)

https://www.nytimes.com/2019/10/22/business/mcdonalds-tech-artificial-intelligence-machine-learning-fast-food.html