CloudEvents

A Standard for Event-Driven Architectures

Christian Schabetsberger, 2025

“A specification for describing event data in a common way”

https://cloudevents.io/

So therefore this is a somewhat unusual Cloud Native Linz talk

This talks doesn’t contain

- Any fancy Kubernetes stuff
- Any groundbreaking new thing
- It is a call for standardisation

Why you ask?

Because of this madness

Microsoft - Event Grid

```
{
  "topic": "/sul
  "subject": "/s
  "eventType": "
  "eventTime": "
  "id": "25b3b0
  "data": {
    "authorizat
    "claims": "
    "correlatio
    "httpReques
    "resourcePr
    "resourceUr
    "operationN
    "status": "s
    "subscripti
    "tenantId":
  }
}
```

Google - Cloud Functions

```
{
  "data": {
    "@type": "types.googleapis.com
    "attributes": {
      "foo": "bar"
    },
    "messageId": "12345",
    "publishTime": "2017-06-05T12
    "data": "somebase64encodedmes
  },
  "context": {
    "eventId": "12345",
    "timestamp": "2017-06-05T12:00
    "eventTypeId": "google.pubsub.
    "resource": {
      "name": "projects/myProject/
      "service": "pubsub.googleap
    }
  }
}
```

Adobe - I/O Events

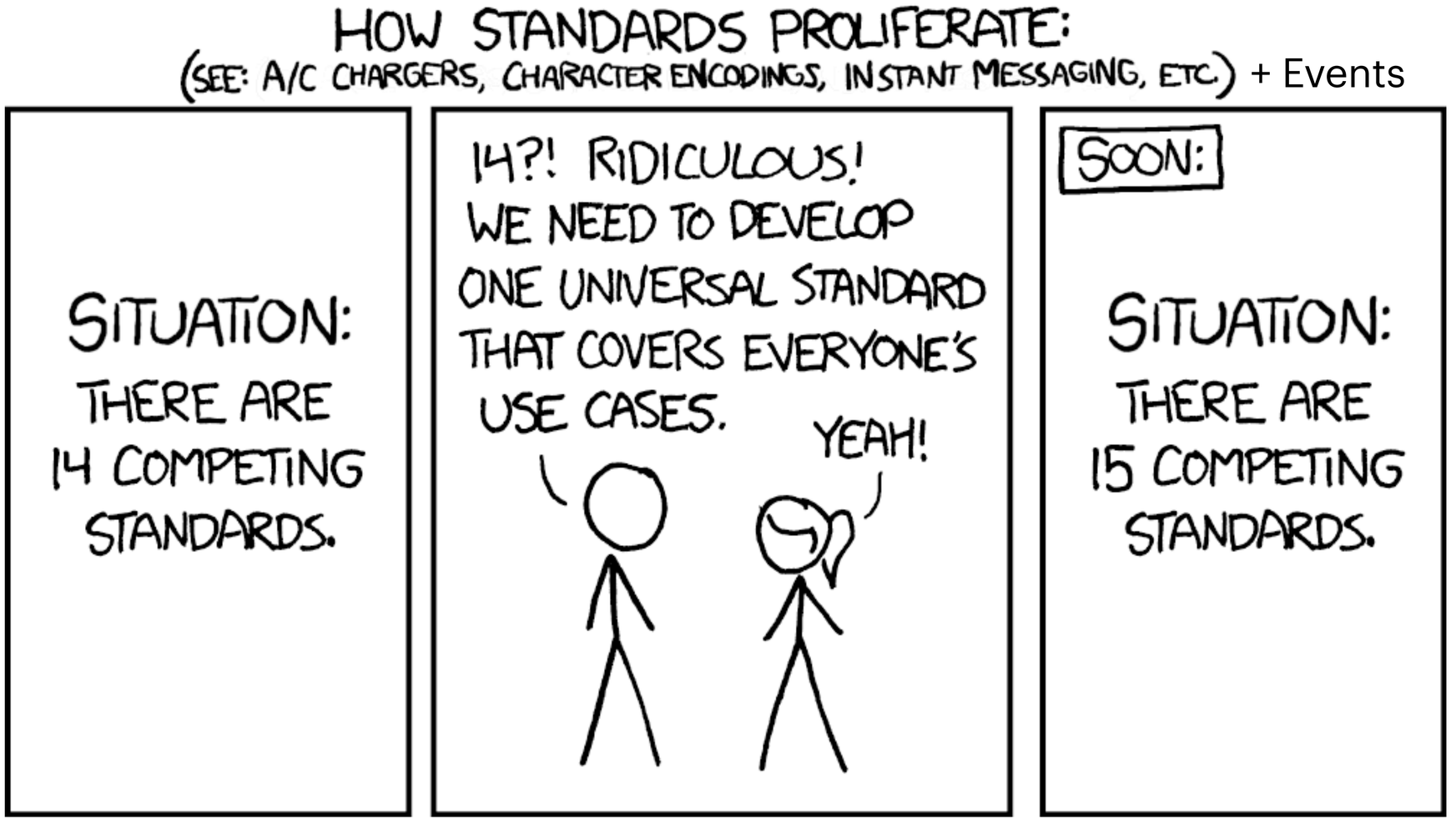
```
{
  "event_id": "639fd17a-d0bb-40ca-83a4-e78612bce5dc",
  "event": {
    "@id": "82235bac-2b81-4e70-90b5-2bd1f04b5c7b",
    "@type": "xdmCreated",
    "xdmEventEnvelope:objectType": "xdmAsset",
    "activitystreams:to": {
      "xdmImsUser:id": "D13A1E7053E46A220A4C86E1@AdobeID",
      "@type": "xdmImsUser"
    },
    "activitystreams:generator": {
      "xdmContentRepository:root": "https://cc-api-storage.adobe.io/",
      "@type": "xdmContentRepository"
    },
    "activitystreams:actor": {
      "xdmImsUser:id": "D13A1E7053E46A220A4C86E1@AdobeID",
      "@type": "xdmImsUser"
    },
    "activitystreams:object": {
      "@type": "xdmAsset",
      "xdmAsset:asset_id": "urn:aaid:sc:us:4123ba4c-93a8-4c5d-b979-ffbbe4318185",
      "xdmAsset:asset_name": "example.jpg",
      "xdmAsset:etag": "6fc55d0389d856ae7deccebba54f110e",
      "xdmAsset:path": "/MyFolder/example.jpg",
      "xdmAsset:format": "image/jpeg"
    },
    "activitystreams:published": "2016-07-16T19:20:30+01:00"
  }
}
```

eb Action Event

```
post",
[
",
'close",
n": "4",
 "text/plain",
7.0.1",
'curl/7.43.0"


ne"
```

https://github.com/cloudevents/spec/blob/main/cloudevents/primer.md#existing-event-formats



https://xkcd.com/927/

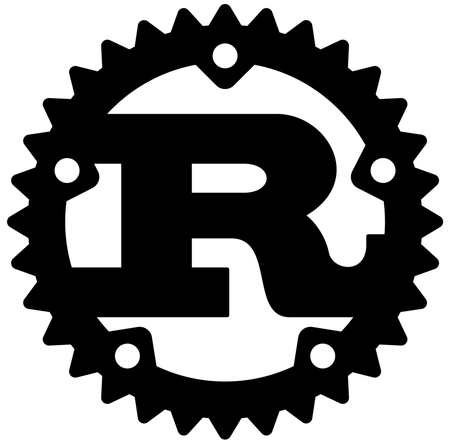
What are CloudEvents?

CloudEvents

Hard Facts

- CNCF Project since 2018
- Provides a core specification
- Supports different kind of formats (f. e. JSON) and bindings (f. e. HTTP)
- Provides documented extension specifications
- Provides SDKs for various programming languages
- And a lot more

SDKs



CloudEvents

Goals

- Consistency
- Accessibility
- Portability

Nice story, show me the format!

JSON Format

```
{
    "specversion" : "1.0",
    "type" : "com.github.pull_request.opened",
    "source" : "https://github.com/cloudevents/spec/pull",
    "subject" : "123",
    "id" : "A234-1234-1234",
    "time" : "2018-04-05T17:31:00Z",
    "datacontenttype" : "text/xml",
    "data" : "<much wow=\"xml\"/>"
}
```

HTTP - Binary

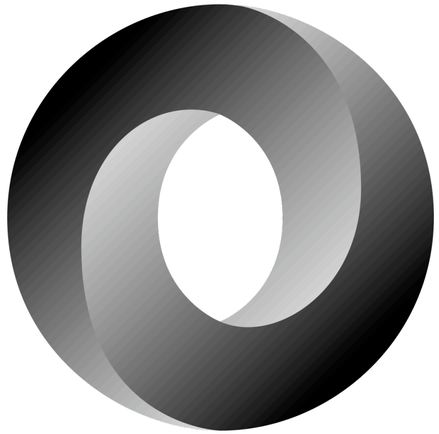
```
POST /someresource HTTP/1.1
Host: webhook.example.com
ce-specversion: 1.0
ce-type: com.example.someevent
ce-time: 2018-04-05T03:56:24Z
ce-id: 1234-1234-1234
ce-source: /mycontext/subcontext
Content-Type: application/json; charset=utf-8
Content-Length: nnnn

{
    "myProperty": "my-value"
}
```

HTTP - Structured

```
PUT /myresource HTTP/1.1
Host: webhook.example.com
Content-Type: application/cloudevents+json; charset=utf-8
Content-Length: n
{
    "specversion" : "1.0",
    "type" : "com.example.someevent",
   ... further attributes omitted ...
    "data" : {
        "myProperty": "my-value"
    }
}
```

Formats & Bindings



The core attributes

id

- String
- Each event must have an unique id
- Resent events may have the same id

source

- URI-reference
- Where did that event happen?
- Absolute URI recommended

specversion

- String
- "1.0"

type

- String
- May include versioning information
- Should be prefixed with a reverse-DNS name
  - **`at.cloudnativelinz.`**`myevent.v1`

datacontenttype

- Optional
- String per RFC 2046 (MIME)
  - `text/xml`
  - `application/json`
  - etc.
- Defines the format of `data`

subject

- Optional
- String

time

- Timestamp according to RFC 3339
  - `2020-12-09T16:09:53+00:00`
- When the occurrence happened

data

- The event payload
- Can be anything (primitive value, complex object, even `null`)
- Should fit with what was specified in `datacontenttype`

(Selected) extension specifications

Auth Context

- `authtype`
  - String: app_user, user, service_account, api_key, system, unauthenticated, unknown
- `authid`
  - String
- `authclaims`
  - String
  - JSON representing claims of the principal that triggered the event

Distributed Tracing

- `traceparent`
  - String: W3C TraceContext
    (version, trace ID, span ID, trace options)
- `tracestate`
  - String: a comma-delimited list of key-value pairs
  - Bridging traces between different systems

Expiry Time

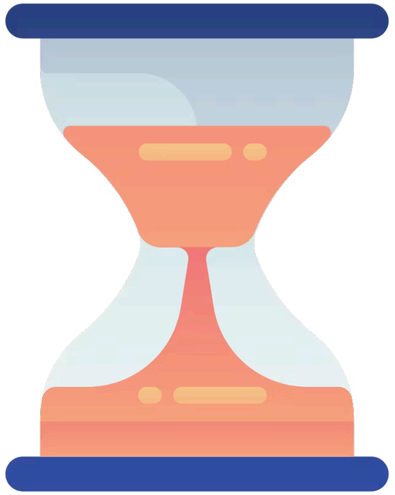
- `expirytime`
  - Timestamp
  - Indicating, an event is no longer useful after the indicated time

Partitioning

- For all the Kafka friends
- `partitionkey`
  - String

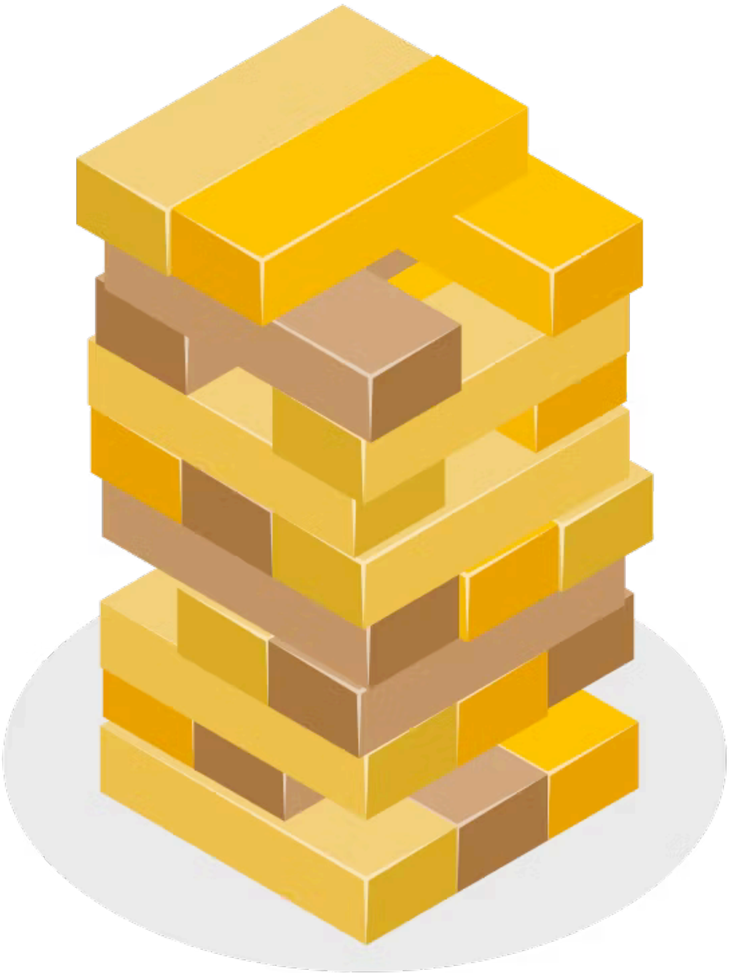
Recorded Time

- `recordedtime`
  - Timestamp
  - When the occurrence was recorded in this CloudEvent, i.e. when the CloudEvent was created by a producer
  - vs. time field: when event occurred!
    - Think about a migration of historic data would have different values



Other extensions

- BAM (Business Activity Monitoring)
- Data Classification
- Dataref
- Deprecation
- OPC UA
- Sampled Rate
- Sequence
- Severity



Create your own extension!

Who is on board?

CloudEvent Adopters

Azure Event Grid

Event Grid natively supports events in the **JSON implementation of CloudEvents v1.0** and the **HTTP protocol binding**

Amazon EventBridge

Amazon EventBridge supports sending CloudEvents to targets in the **JSON implementation of CloudEvents v1.0** and the **HTTP protocol binding** in EventBridge API destinations

Argo Events

Argo Events is a CloudEvents compliant event-driven workflow automation framework for Kubernetes

Debezium

Debezium, a distributed open-source change data capture platform, can emit change data events **in the CloudEvents format**

Google Cloud Eventarc

Eventarc is a managed infrastructure that allows you to build event-driven architectures with loosely coupled services that react to state changes

Keptn

Keptn builds upon CloudEvents for continuous delivery and automated operations and has its **specification** based on CloudEvents

And many more!

https://cloudevents.io/ # CloudEvent Adopters

Case study: customer project

Customer Project
Intro

- B2B Application
- Distributed System
- Asynchronous, message based system
  - “Business events”
- Used a couple of extension specifications
  - Auth Context, Distributed Tracing, Recorded Time

Customer Project

Use Cases

- Common messaging format for all events
- Distributed tracing over multiple services
  - Using the Distributed Tracing extension
- Build a event sourcing system
  - That could save any CloudEvent and replay them later

Demo

Recap

- Use CloudEvents for your events!
- It’s well documented
- Has a ton of SDKs
- Let’s make the world a little more interoperable

Links

- https://cloudevents.io/
- https://github.com/cloudevents/spec/blob/main/cloudevents/spec.md
- https://github.com/cloudevents/spec/tree/main/cloudevents/extensions
- https://github.com/cloudevents/spec/tree/main/cloudevents/formats
- https://github.com/cloudevents/spec/tree/main/cloudevents/bindings

Questions?