



**BTP**

# Provenance Built on Open Source

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Hyperledger In-Depth Webinar with BTP

25 January 2022



01

**Provenance**

# Provenance

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The term *provenance* is often associated with the art world. However, recording and sharing provenance data can provide significant value across industries...



*Provenance* captures the origin and life journey – including the ownership history – of a physical or digital asset.

# Why Provenance Matters

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Transparency & Trust  
Anti-fraud & Anti-counterfeiting  
Consumer Safety  
Ethical Sourcing  
Environmental Sustainability  
Resilient Supply Chains





02

**Chronicle**

# Our Value Proposition

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We are a digital provenance company with a mission to make assets trustworthy. We believe that provenance is a force for good, as it brings transparency and trust to a wide range of markets.

We make it easy for organizations to record and query immutable provenance information on a distributed ledger, about any asset, in any domain, across multiple parties.

We do this by providing [Chronicle](#), our open-source, blockchain-backed, domain-agnostic provenance product.

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# The Chronicle Story

**Chronicle**  
Created by Hyperledger Global on Feb 01, 2021

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Version 1 Next

Chronicle is a set of commands and components to add such capabilities to any enterprise system. The **chronicle** system draws heavily on the PROV object you will find a JSON object using the PROV tool. While explicitly I am a fan of the W3C PROV tool.

References

- <https://www.d.org/7/prev-of>
- <https://en-14.org/>

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**Provenance, CBDCs and Identity at Hyperledger Global Forum 2021**  
Key themes driving digital transformation and decentralization

Last week, **BTP** sponsored and participated in **Hyperledger Global Forum** – the Linux Foundation's virtual enterprise blockchain event – where presentations and panel discussions reinforced our sense that amid the pandemic and the resulting economic downturn, digital transformation has accelerated across industries, in many cases, out of necessity.

In particular, the need for technologies that help improve transparency and trustworthiness in our interactions, and remove operational inefficiencies from business processes across organizations, came through loud and clear and distributed ledger technology (DLT) plays a foundational role here.

Key application areas where activity has intensified – those that have turned to be real proving grounds for DLT – were discussed and showcased at HGF 2021. These included provenance, payments and financial instruments and identity. Economists at PwC, in a report entitled **Time for trust: The trillion-dollar reasons to rethink blockchain** published at the end of 2020, identified these areas as top areas that drive DLT adoption and have the potential to be the most economic value.

**Provenance**

The ability to digitally verify the origin and authenticity of assets and track them throughout their lifecycle, helps organizations mitigate the risk of counterfeit and fraud among other types of risk – a need that has been amplified during the pandemic. Distributed ledgers, smart contracts and

**Is Provenance a Killer Application for Blockchain?**  
Provenance May Start with but Does Not Stop at Art

In the art world, provenance... need no introduction.

**Introducing Chronicle: Blockchain-Backed Provenance**  
BTP Launches New Product at the European Blockchain Convention

Today, we are officially launching **Chronicle**, our blockchain-backed and domain-agnostic solution for immutably recording provenance data, at the Enterprise Blockchain Convention that is taking place in Barcelona.

The ability to track the provenance of an asset – in a trusted and efficient way – can translate into immense value across industries, and blockchain and associated technologies can be a real differentiator here.

**Provenance and Why It Matters**

The term provenance originally comes from the art world, where it essentially refers to the chronology of the ownership and location of an artwork. As discussed in my previous post – **Is Provenance a Killer Application for Blockchain** – art collectors require reliable provenance records that confirm the authenticity as well as the proof of ownership of the artwork they wish to acquire. Verifiable information on specific events in an artwork's journey – e.g. its inclusion in a renowned collection – may increase the desirability, hence the value of a particular piece of art to potential buyers. Holes in an artwork's history, on the other hand, are undesirable as those may indicate possible forgery or theft.

The importance of provenance doesn't stop at art, however. The benefits of recording and sharing provenance data have caught the attention of a number of industries – including commodities, energy, food and beverages, just to name a few.

**Chronicle**  
btpworks/chronicle

**Chronicle: You Say Provenance, We Say Open Source**  
BTP's Blockchain-Backed Provenance Product, Chronicle, Is Now Open Source

We at **BTP** launched **Chronicle** – our blockchain-backed, domain-agnostic provenance product – last summer at the European Blockchain Convention, and made it generally available at the Hyperledger Global Forum in September 2022. We have now open-sourced it on **GitHub**, as proprietary code has no place in a blockchain stack.

**How It All Started**

A while ago, we identified provenance as an area that offered great potential to not only boost the adoption of blockchain and associated technologies, but also to generate significant economic value across industries.

We strongly believe that provenance is a force for good, as it brings transparency and trust to a wide range of markets; and that the lack of efficient and trustworthy provenance negatively affects both businesses and consumers, and can cause serious harm to the global economy.

Organizations across industries can now take advantage of Chronicle's capabilities, and keep immutable provenance records that capture the origin and life journey of their physical and digital assets, including ownership history. By recording it on a distributed ledger, provenance information becomes more trustworthy, and its management is more efficient.

"We have invested in Chronicle because we are convinced that having the ability to verify the origin and track the journey of an asset in a trusted and efficient manner, can translate into immense value in a wide range of industries," said Duncan Johnston-Watt, Co-founder & CEO at BTP. "Our investment has already started to

# Chronicle

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[btp.works/chronicle](https://btp.works/chronicle)

Open-source, blockchain-backed, domain-agnostic product for immutably recording and querying provenance data.

Built on the **W3C PROV Ontology** specification; uses the lightweight **JSON-LD** linked data format, and the data query language **GraphQL**.

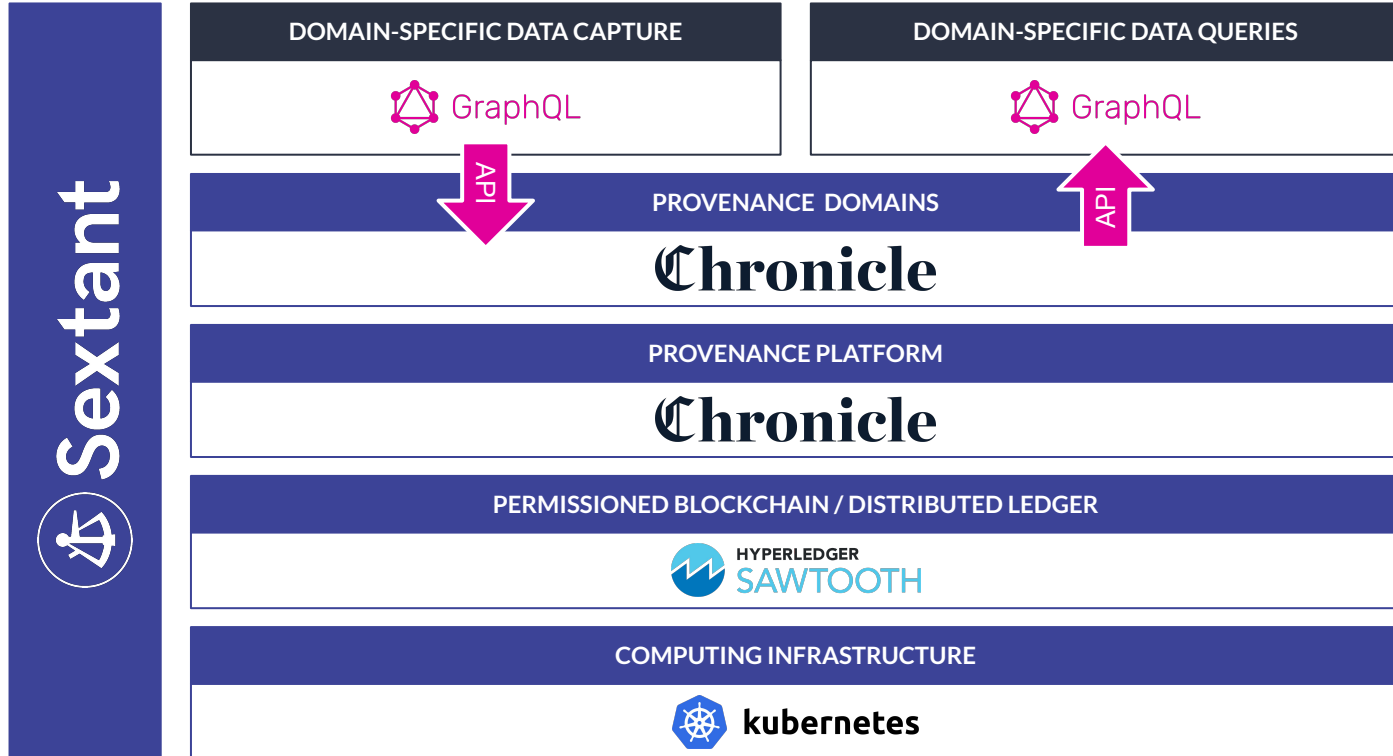
Records provenance information of any physical or digital asset on a distributed ledger. Available with **Hyperledger Sawtooth** as its default backing ledger.

Easily configurable to enable users to capture provenance information for a range of domain-specific applications.

Delivered by [Sextant](#), to facilitate its deployment and management, as well its integration with enterprise systems.



# Chronicle Stack

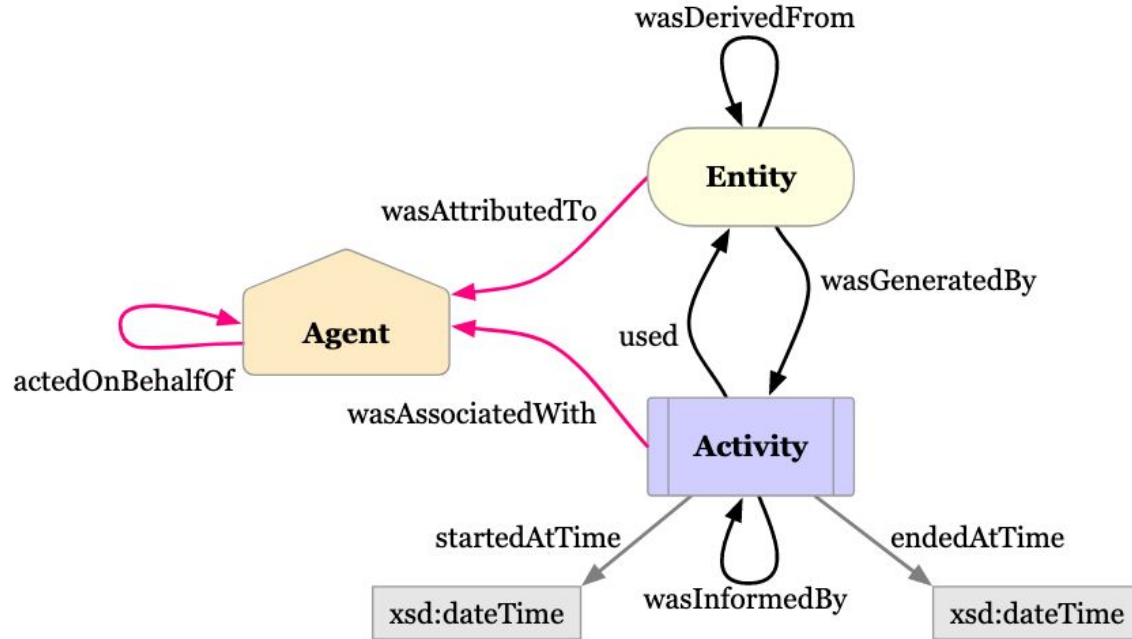




03

Demo

# PROV-O: Domain-Agnostic Ontology



# Domain-Specific Ontology

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Domain: Manufacturing

Assets (aka *Entities* in PROV-O speak): Item, Certificate

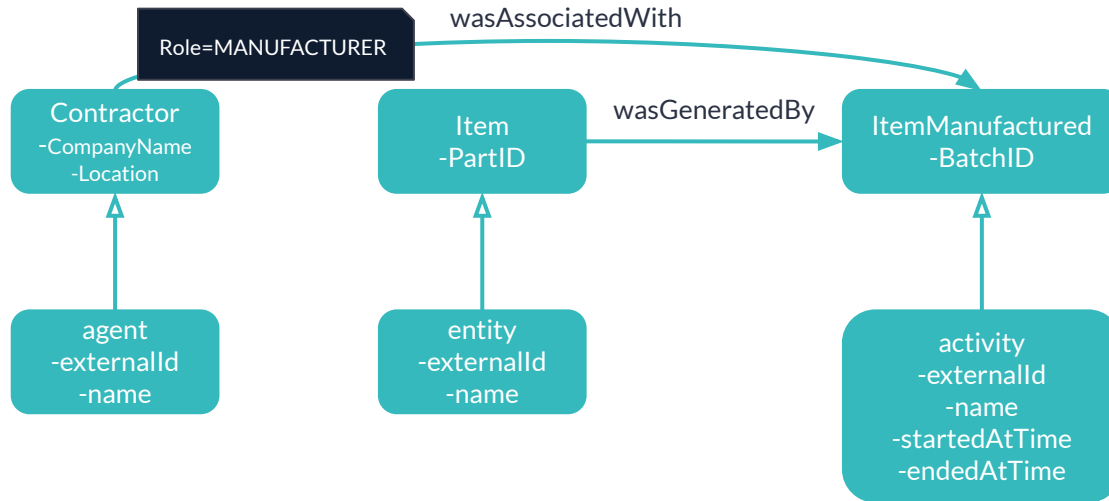
Agents: Contractor

Activities: ItemManufactured, ItemCertified

# See the [Manufacturing Example Guide](#)

# Item Manufacturing

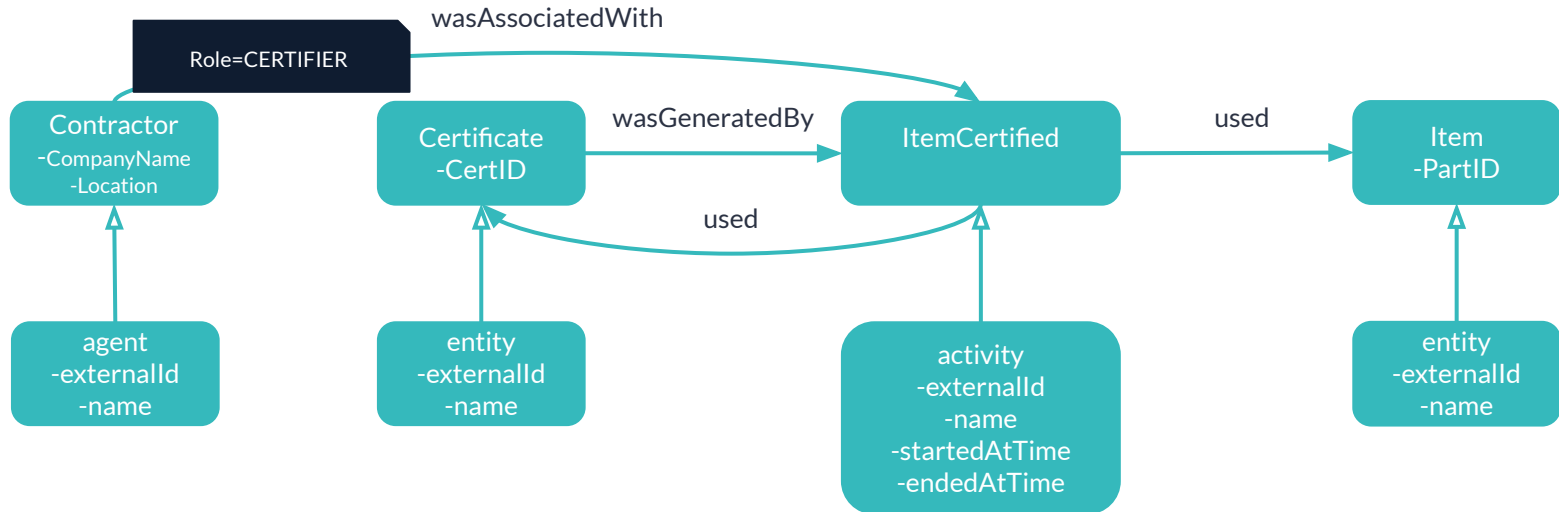
Although various agents may be involved in the *ItemManufactured* activity, in this example, the *Contractor* is the only agent responsible for the manufacturing of the *Item*.





# Item Certification

The *Contractor* issues a *Certificate* for each item. The *ItemCertified* activity uses this item.



# Resources

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[Join Chronicle Works on Slack](#)

[Github - btpworks/chronicle](#)

[Github - btpworks/chronicle-examples](#)

[Github - blockchaintp/sawtooth-core](#)

[Chronicle: You Say Provenance, We Say Open Source](#)

[Is Provenance a Killer App for Blockchain?](#)



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04

Appendix

# Getting Started

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## # Clone Repo

```
git clone https://github.com/btpworks/chronicle-examples.git  
cd chronicle-examples
```

## # Build Manufacturing Example

```
make run-manufacturing
```

## # Connect to GraphQL Playground

```
http://127.0.0.1:9982/
```

## # See the [README.md](#)



# Subscription



```
subscription {  
  commitNotifications {  
    delta  
  }  
} # Write your query or mutation here
```

# Define Contractors

```
mutation {
  agent1: defineContractorAgent(
    externalId: "helicoptersplc"
    attributes: {
      companyNameAttribute: "Helicopters PLC"
      locationAttribute: "Bristol, England"
    }
  ) {
    context
    txId
  }
  agent2: defineContractorAgent(
    externalId: "acmecorp"
    attributes: {
      companyNameAttribute: "ACME Corp"
      locationAttribute: "Burbank, California"
    }
  ) {
    context
    txId
  }
}
```

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# Query Contractors



```
query {  
  agentsByType(agentType: ContractorAgent) {  
    nodes {  
      __typename  
      ... on ContractorAgent {  
        externalId  
        companyNameAttribute  
        locationAttribute  
      }  
    }  
  }  
}
```

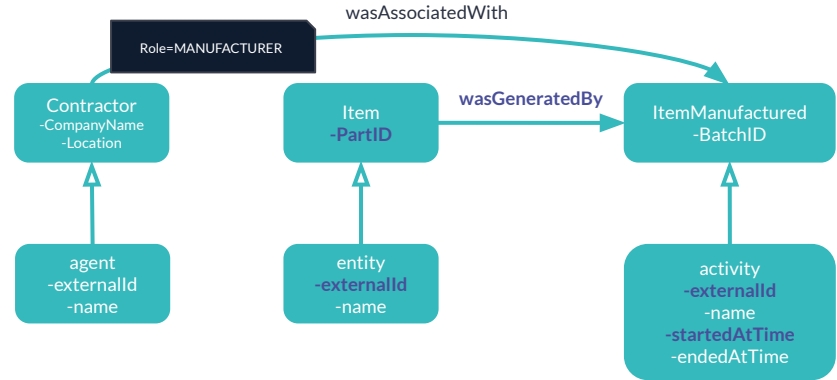
# Define ItemManufactured Activity

```
mutation {
  defineItemManufacturedActivity(
    externalId: "rotorblademade-run-001"
    attributes: { batchIDAttribute: "run-001" }
  ) {
    context
    txId
  }
  wasAssociatedWith(
    activity: { externalId: "rotorblademade-run-001" }
    responsible: { externalId: "helicoptersplc" }
    role: MANUFACTURER
  ) {
    context
    txId
  }
}
```



# Start ItemManufactured Activity

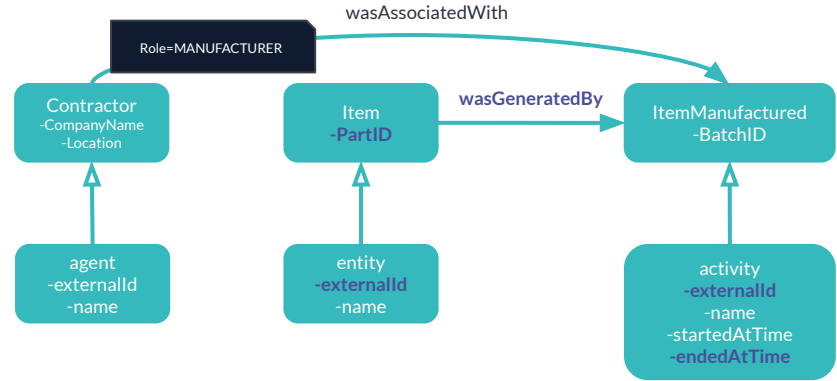
```
mutation {
  startActivity(id: { externalId: "rotorblademake-run-001" }) {
    context
    txId
  }
  i1: defineItemEntity(
    externalId: "rotorblade-run-001-001"
    attributes: { partIDAttribute: "run-001-001" }
  ) {
    context
    txId
  }
  g1: wasGeneratedBy(
    id: { externalId: "rotorblade-run-001-001" }
    activity: { externalId: "rotorblademake-run-001" }
  ) {
    context
    txId
  }
}
```





# End ItemManufactured Activity

```
mutation {
  i2:defineItemEntity(
    externalId: "rotorblade-run-001-002"
    attributes: { partIDAtribute: "run-001-002" }
  ) {
    context
    txId
  }
  g2:wasGeneratedBy(
    id: { externalId: "rotorblade-run-001-002" }
    activity: { externalId: "rotorblademake-run-001" }
  ) {
    context
    txId
  }
  endActivity(id: { externalId: "rotorblademake-run-001" }) {
    context
    txId
  }
}
```



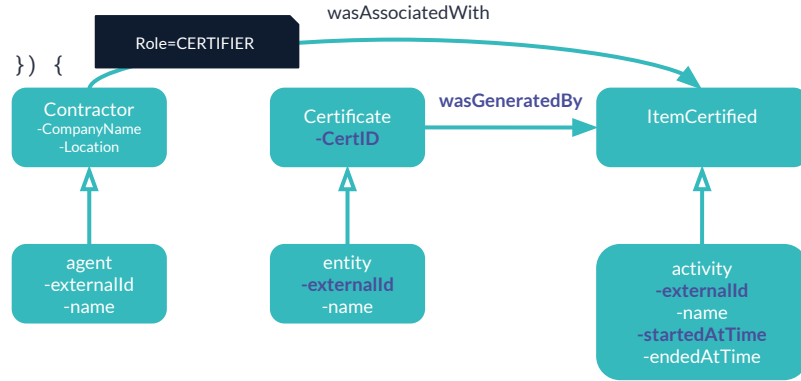
# Define ItemCertified Activity

```
mutation {  
  defineItemCertifiedActivity(  
    externalId: "rotorbladecert-run-001-001" ) {  
    context  
    txId  
  }  
  wasAssociatedWith(  
    activity: {  
      externalId: "rotorbladecert-run-001-001" }  
    responsible: { externalId: "helicoptersplc" }  
    role: CERTIFIER  
  ) {  
    context  
    txId  
  }  
}
```



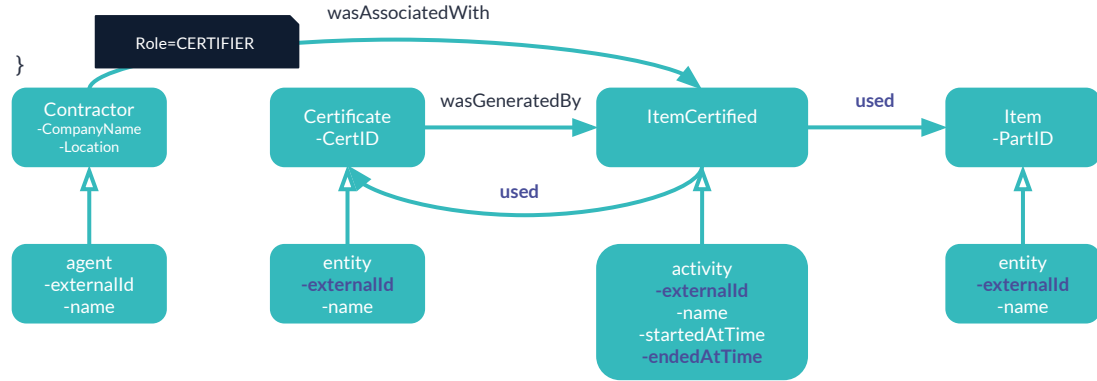
# Start ItemCertified Activity

```
mutation {
  startActivity(
    id: { externalId: "rotorbladecert-run-001-001" }) {
    context
    txId
  }
  defineCertificateEntity(
    externalId: "rotorbladecert-run-001-001"
    attributes: { certIDAttribute: "run-001-001" }
  ) {
    context
    txId
  }
  wasGeneratedBy(
    id: { externalId: "rotorbladecert-run-001-001" }
    activity: { externalId: "rotorbladecert-run-001-001" }
  ) {
    context
    txId
  }
}
```



# End ItemCertified Activity

```
mutation {
  cert: used(
    id: { externalId: "rotorbladecert-run-001-001" }
    activity: {
      externalId: "rotorbladecert-run-001-001" }
  ) {
    context
    txId
  }
  blade: used(
    id: { externalId: "rotorblade-run-001-001" }
    activity: {
      externalId: "rotorbladecert-run-001-001" }
  ) {
    context
    txId
  }
  endActivity(id: { externalId: "rotorbladecert-run-001-001" }) {
    context
    txId
  }
}
```



# Query Item #1

---

```
query {
  q1: entityById(id: { externalId: "rotorblade-run-001-001" }) {
    ... on ItemEntity {
      partIDAttribute
      wasGeneratedBy {
        ... on ItemManufacturedActivity {
          id
        }
      }
    }
  }
  q2: entityById(id: { externalId: "rotorbladecert-run-001-001" }) {
    ... on CertificateEntity {
      certIDAttribute
      wasGeneratedBy {
        ... on ItemCertifiedActivity {
          id
        }
      }
    }
  }
}
```

# Query Item #2

---

```
query {
  q3: entityById(id: { externalId: "rotorblade-run-001-002" }) {
    ... on ItemEntity {
      partIDAttribute
      wasGeneratedBy {
        ... on ItemManufacturedActivity {
          id
        }
      }
    }
  }
  q4: entityById(id: { externalId: "rotorbladecert-run-001-002" }) {
    ... on CertificateEntity {
      certIDAttribute
      wasGeneratedBy {
        ... on ItemCertifiedActivity {
          id
        }
      }
    }
  }
}
```