dbt sources

INTRODUCTION TO DBT

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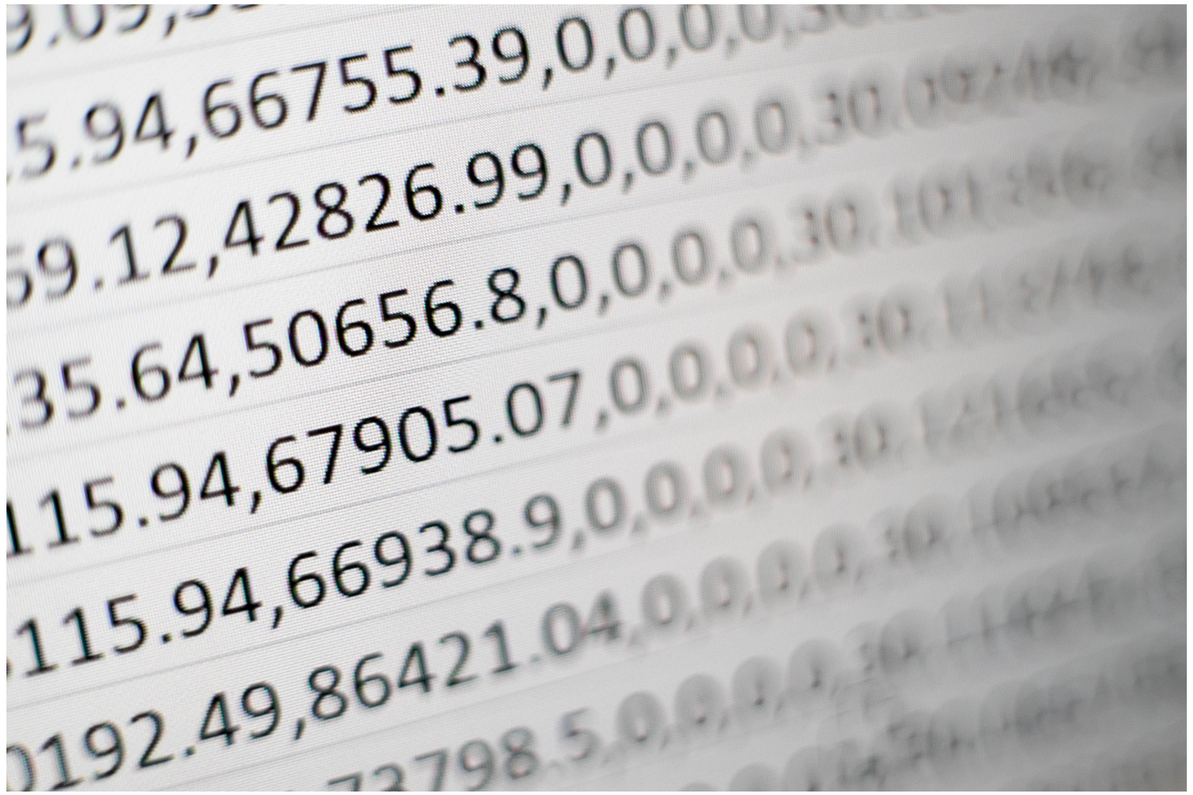
What is a dbt source?

- Name and description of data loaded by EL process
- Helps define data lineage
- Tests
- Documentation



[1] Photo by Mika Baumeister on Unsplash

Sources

- Provides data lineage information
- Describes the flow of data in warehouse
- Use the Jinja `{{ source() }}` function
  - Similar to the `{{ ref() }}` function
- Simplifies accessing raw data

```
select *
from
  {{ source('raw', 'orders') }}
```

Defining a source

- In the .yml file
- File can be `models/model_properties.yml`
  - Or any other .yml file in the directory
- Under the `sources:` section
- Name the source with the `- name:` option
- Define each source table with a `- name:` option under `tables:`
- Different options available depending on the data warehouse type, refer to dbt documentation.

```
version: 2

sources:
  - name: raw
    tables:
      - name: phone_orders
      - name: web_orders
```

Accessing sources

- Use the `{{ source() }}`
- `{{ source(source_name, table_name) }}`
- Provides the proper name of the table in the compiled query

```
select * from
  {{ source('raw', 'phone_orders') }}
UNION
select * from
  {{ source('raw', 'web_orders') }}
```

```
-- dbt compiled
select * from
  'raw'.'phone_orders'
UNION
select * from
  'raw'.'web_orders'
```

Testing sources

- You can apply tests to sources
- Same methods as applying to models
- Defined in the `sources:` section instead of `models:`
- In .yml file where sources defined

```
version: 2


sources:
  - name: raw
    tables:
      - name: phone_orders
        columns:
          - name: id
            tests:
              - not_null
              - unique
      - name: web_orders
```

Documentation

- Document using the same tools as models
- Defined in the `sources:` section

```
version: 2


sources:
  - name: raw
    tables:
      - name: phone_orders
        description: >
          Sales orders by phone, daily
        columns:
          - name: id
            tests:
              - not_null
              - unique
```

Let's practice!

INTRODUCTION TO DBT

dbt seeds

INTRODUCTION TO DBT

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What are dbt seeds?

- CSV files to be loaded into data warehouse
- Typically rarely changing sets of data
  - List of countries
  - List of postal codes
- *NOT* meant for raw data

[1] Photo by Maddi Bazzocco on Unsplash

Why?

- Easy to manage
- Easy to use in various scenarios
- Source controllable

How are seeds defined?

- Add CSV file to the `seeds` directory
- Make sure the header is the first row
- Import using the `dbt seed` command

```
zipcode,place,state
99553,Akutan,Alaska
99571,Cold Bay,Alaska
99583,False Pass,Alaska
bash> dbt seed
```

[1] Postal codes provided via https://github.com/zauberware/postal-codes-json-xml-csv

Further configuration

- Several options
  - Which schema?
  - What database?
  - Column quoting
  - Column data types
- Can be applied to the whole project or to individual seeds
- Can be added to `dbt_project.yml` or `seeds/properties.yml`

Defining datatypes

- Available data types depend on data warehouse
- Typical ones are available
  - Integer
  - Varchar
  - etc
- If type is not defined, it is inferred based on the data

```
version: 2


seeds:
  - name: zipcodes
    config:
      column_types:
        zipcode: varchar(5)
```

Tests & documentation

- Support tests
- Support documentation
- Just like models and sources

```
version: 2


seeds:
  - name: zipcodes
    description: US zipcodes
    config:
      column_types:
        zipcode: varchar(5)
    columns:
      - name: zipcode
        tests:
          - unique
```

Accessing seeds

- Available via the `{{ ref() }}` command
- Behaves as a model after initial import

```
select * from
  {{ ref('zipcodes') }}
```

Let's practice!

INTRODUCTION TO DBT

SCD2 with dbt snapshots

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What is a snapshot?

- A look into the changes of a dataset over time
- Illustrate the various states of an object, such as
  - Order status
  - Production state
  - Shipping status

[1] Photo by micheile henderson on Unsplash

SCD2

- Slowly changing dimension
  - Type 2
  - SCD2
  - Kimball-style data warehousing
  - *Introduction to Data Warehousing*
- Tracks changes over time
- dbt implements SCD2 with snapshots

[1] Photo by Luke Chesser on Unsplash

SCD2 example

- Order status
- Available states:
  - Received
  - Packed
  - Shipped

id	order_status	last_updated
1	Shipped	2023-07-01 11:30

id	order_status	last_updated
1	Received	2023-07-01 10:45
1	Packed	2023-07-01 11:15
1	Shipped	2023-07-01 11:30

SCD2 in dbt

- dbt uses snapshots to implement SCD2
- Can track the changes automatically
- Adds extra columns to the output
  - `dbt_valid_from`
  - `dbt_valid_to`

id	order_status	last_updated	dbt_valid_from	dbt_valid_to
1	Received	2023-07-01 10:45	2023-07-01 10:45	2023-07-01 11:15
1	Packed	2023-07-01 11:15	2023-07-01 11:15	2023-07-01 11:30
1	Shipped	2023-07-01 11:30	2023-07-01 11:30	null

Implementing dbt snapshots

- SQL file, `snapshots/snapshot_name.sql`

```
{% snapshot snapshot_orders %}
  {{ config(
       target_schema='snapshots',
       strategy='timestamp',
       unique_key='id',
       updated_at='last_updated'
     )
  }}
  select * from {{ source('raw', 'orders') }}
{% endsnapshot %}
```

dbt snapshot

- Run `dbt snapshot`
- Create new model using the `ref()` command to query snapshot
  - `select * from {{ ref('snapshot_orders') }}`
- Run `dbt snapshot` frequently to see potentially changed data
  - Schedule for automatic updates

Let's practice!

INTRODUCTION TO DBT

Automating with dbt build

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datacamp

Review

- `sources` and `seeds` feed initial data to dbt
- `models` handle the transformation of data (usually from `sources` / `seeds`) for downstream users
- `snapshots` track changes in datasets
- `tests` can validate `sources`, `seeds`, `models`, and even `snapshots`
  - Built-in (unique, not_null, relation, accepted_values)
  - Singular
  - Generic / Reusable
- `dbt build` performs all these tasks, usually in production

dbt build

`dbt build`:

- Combination of multiple tasks
- Runs models (`dbt run`)
- Run validations via tests (`dbt test`)
- Create snapshots (`dbt snapshot`)
- Process any seeds (`dbt seed`)

Remember the commands can be run individually if required

[1] Photo by Randy Fath on Unsplash

Why?

- Individual subcommands work well, but don't handle all potential issues
  - `dbt run` doesn't validate first (ie, no tests are run)
  - `dbt snapshot` isn't run to maintain any potential changes
  - `dbt seed` may not be complete for certain queries
- `dbt build` will determine dependencies and run all tests prior to production changes
- `dbt build` may be overkill if only testing or small incremental changes are made
- Steps can be run manually instead if required

Let's practice!

INTRODUCTION TO DBT

Course review

INTRODUCTION TO DBT

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What we've learned

- dbt commands
  - `dbt run`, `dbt test`, `dbt -h`
- Projects in dbt
  - General folder structure
  - `dbt_project.yml`
- Creating dbt models with SQL
  - Defining the model in SQL files
  - Modifying the configurations in YAML
- Building on top of existing models
  - Using Jinja `{{ ref() }}` function to build lineage
- Validating our data through testing
  - Creating and applying various tests
    - Built-in
    - Singular tests in SQL
    - Generic tests

What we've learned (continued)

- Documentation
  - Ability to automatically document dbt objects via YAML
  - Generating and serving documentation via `dbt docs`
- Creating dbt sources
  - Defining lineage
  - Adding testing and documentation
- Loading reference data with dbt seeds
  - Creating new seeds via YAML configuration
  - Loading CSV files into data warehouse with `dbt seed`
- Creating SCD2-style tracking with `dbt snapshot`
  - Adding and tracking changes to a dataset via dbt

What we've learned (final)

Troubleshooting

- Models
- Tests
- Snapshots
- Projects

Production considerations

- Using `dbt build`
- Fixing errors with unfamiliar projects

Potential next topics

- Incremental models
  - Loading partial data changes into warehouse without re-loading all data
- More advanced SQL
  - CTEs
- Jinja commands and macros
  - `{{ ENV() }}`, `{% for %}`
- Building models with Python
- Documentation blocks
- Production & automation
  - Adding hooks to run tasks automatically
  - Integrating with orchestrators (such as Airflow)

References

- dbt Documentation
  - https://docs.getdbt.com
- dbt Slack channel
- Countless blogs / newsletters
- Future DataCamp courses

Thank you!

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