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Dagster Deep Dives: Thinking in Partitions

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Dagster is a framework for orchestrating data pipelines

You have the flexibility to build pipelines outright or create a platform to enable others to build their own

As a framework, Dagster is grounded in having strong core building blocks

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Today, we’ll go into detail on part of that core:
Partitions

We’ll cover the fundamentals of them, along with how to think of your data pipelines in partitions

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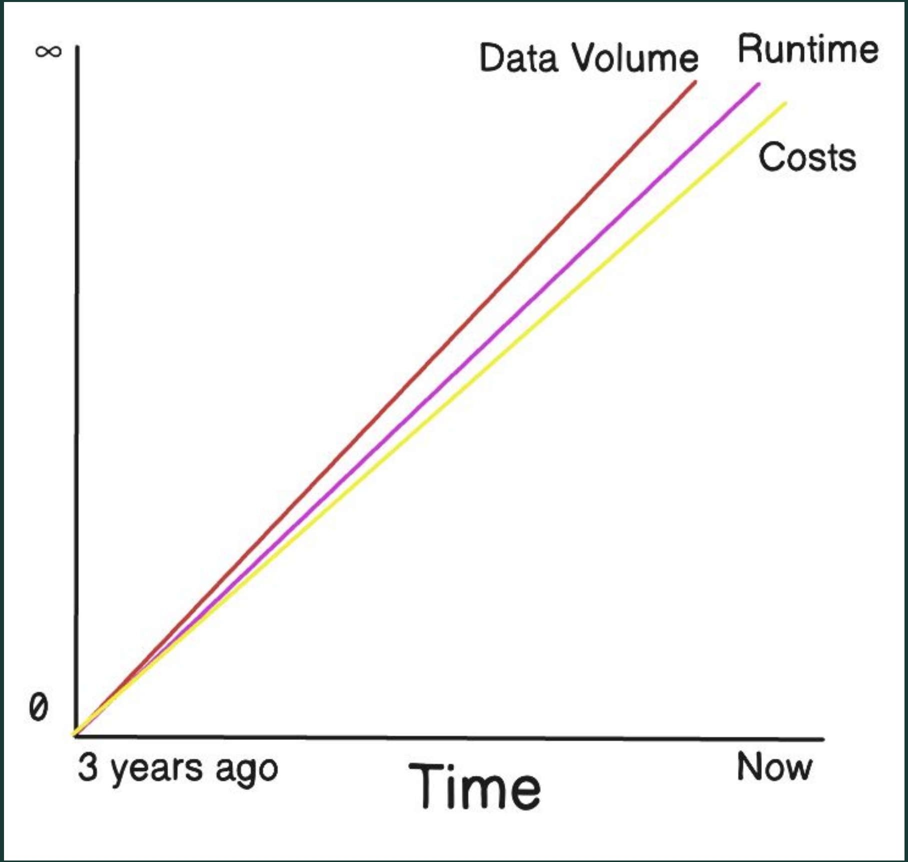
Data pipelines often scale linearly with the size your data, which includes increasing runtime and costs



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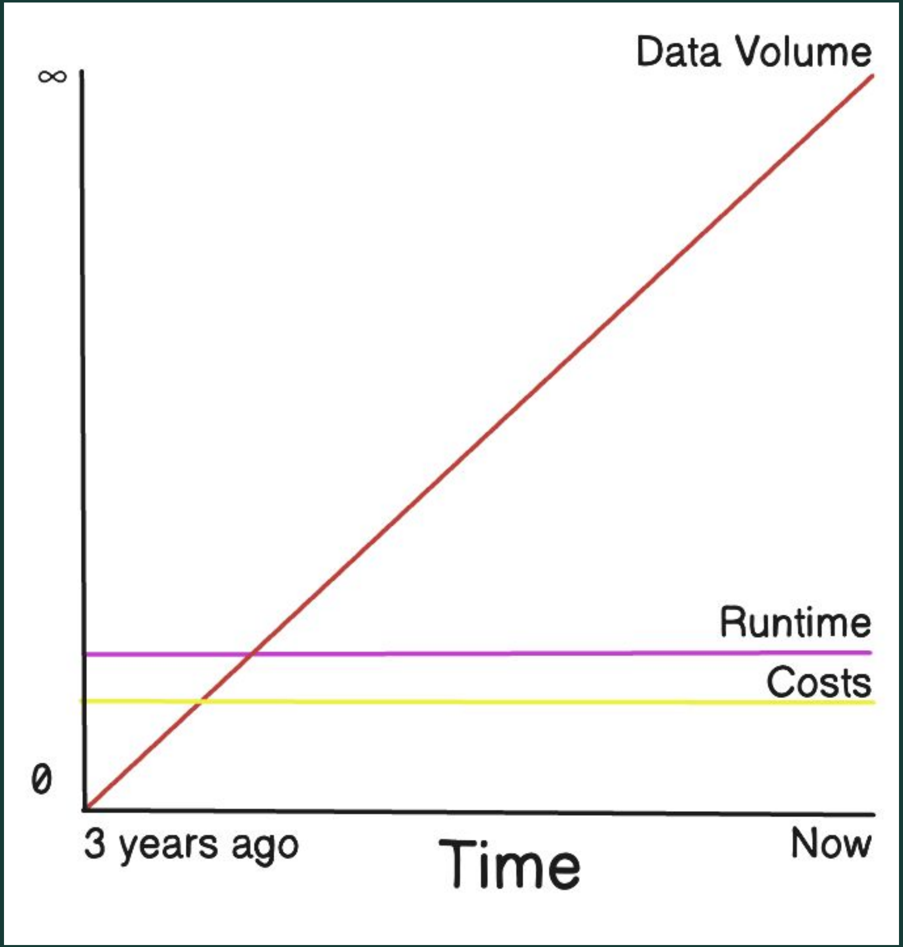
How can you break the relationship between your growing data volume and the resources your pipelines take?



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People have been trying to solve this problem for decades.

One of the best solutions is to **incrementally** load the data.

Working with data **incrementally** means only working with data that has not be loaded yet

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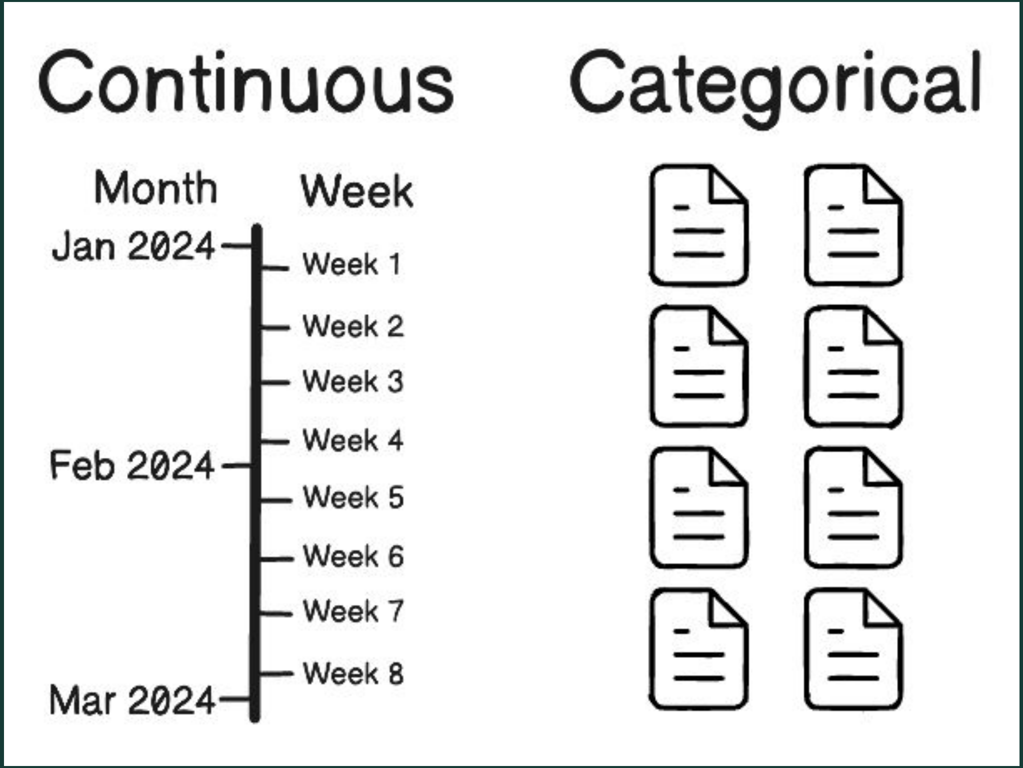
Partitions are a way to model incremental data

Data is partitioned by a shared dimension



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Dagster has native support for **partitions** as one way to maintain incremental data assets

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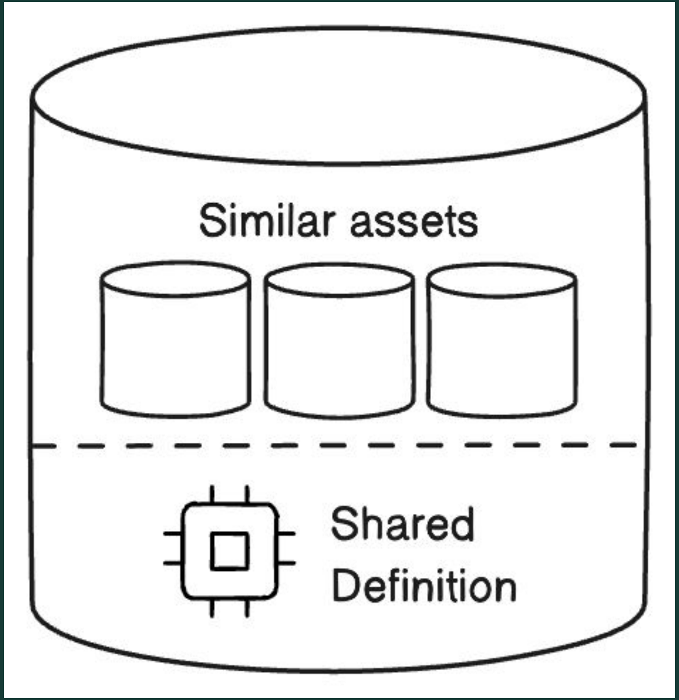
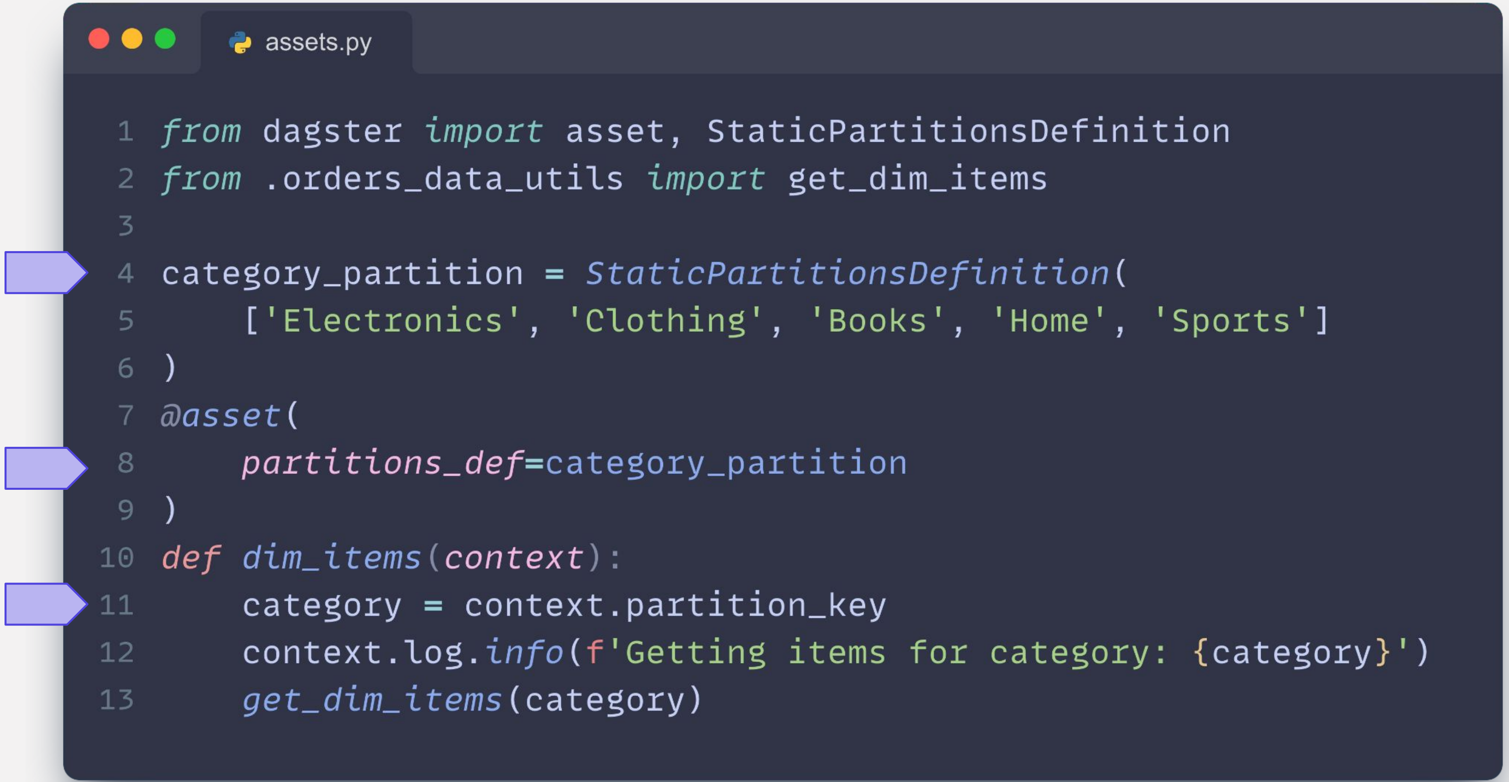


A partitioned asset is a collection of smaller assets that share the same definition (code/deps)

Dagster’s APIs for Partitions

- Categorical Partitions
  - `StaticPartitionsDefinition`
- Time-based Partitions
  - `[Daily][Weekly][Monthly]PartitionsDefinition`
  - `TimeWindowPartitionDefinition(cron_schedule=”0 0 1 1 *”)`
- Partition Mappings
  - `AssetDep`
  - `AllPartitionMapping`
  - `TimeWindowPartitionMapping`
- Accessors
  - `context.partition_key`
  - `context.partition_time_window`



```python
from dagster import asset, StaticPartitionsDefinition
from .orders_data_utils import get_dim_items

category_partition = StaticPartitionsDefinition(
    ['Electronics', 'Clothing', 'Books', 'Home', 'Sports']
)
@asset(
    partitions_def=category_partition
)
def dim_items(context):
    category = context.partition_key
    context.log.info(f'Getting items for category: {category}')
    get_dim_items(category)
```

Demo

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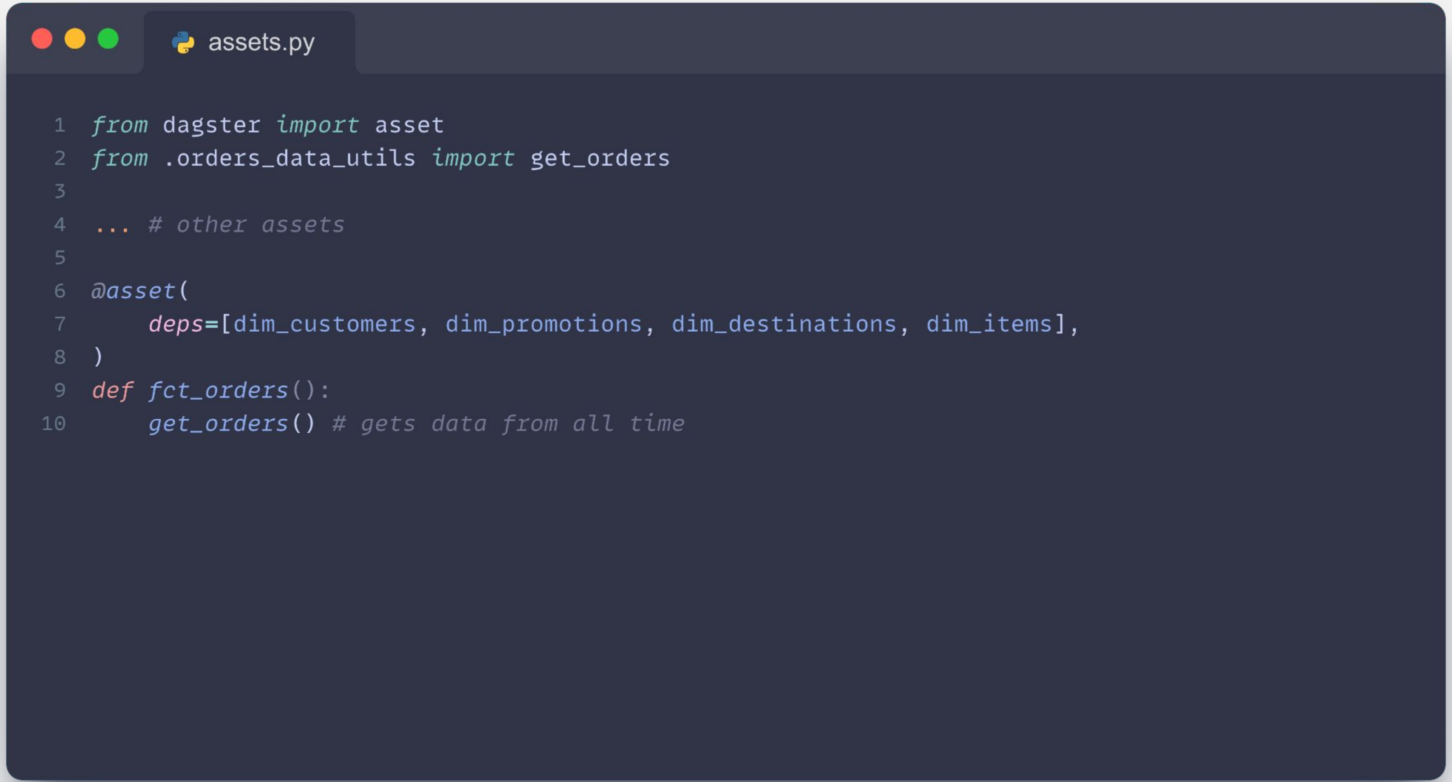
Let’s partition an asset by time

An expensive asset

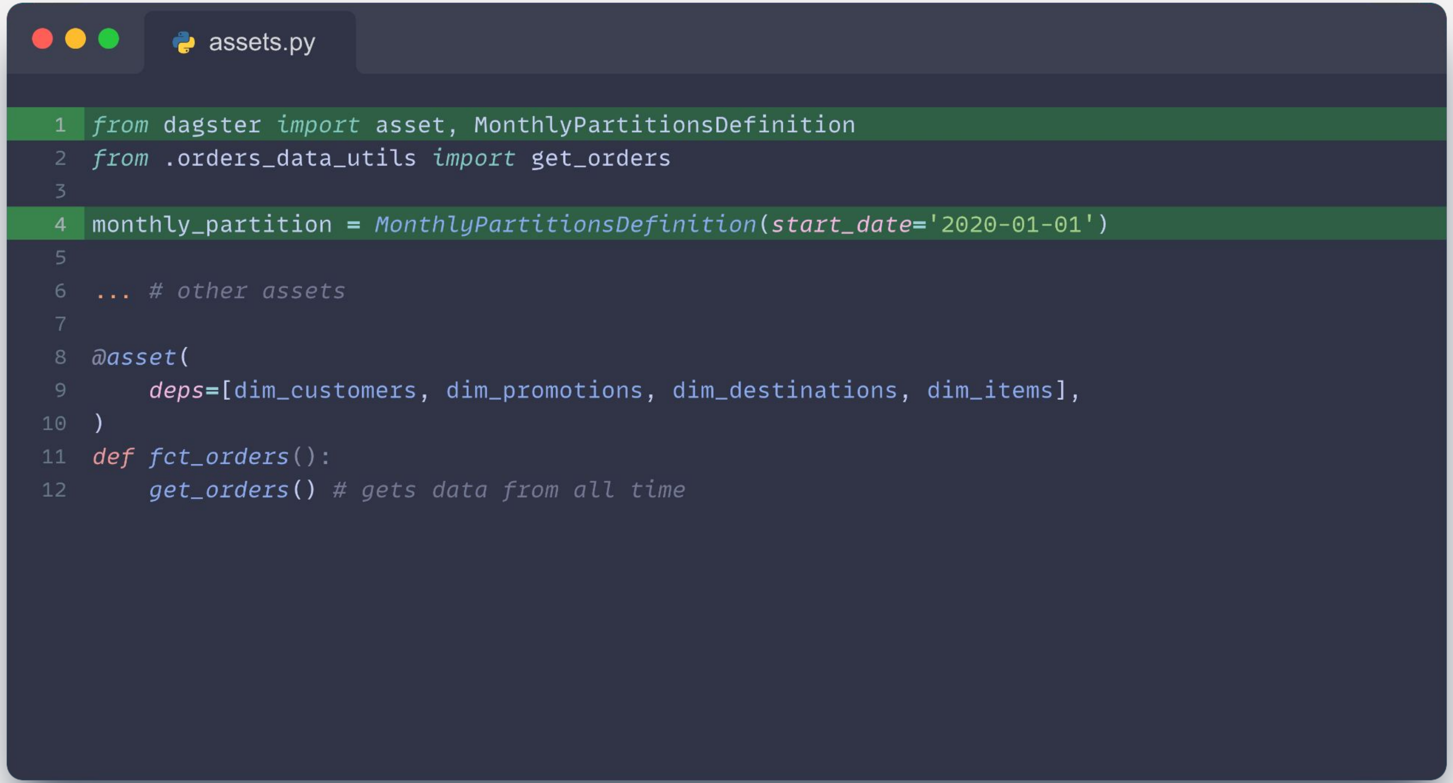


```python
from dagster import asset
from .orders_data_utils import get_orders

... # other assets

@asset(
    deps=[dim_customers, dim_promotions, dim_destinations, dim_items],
)
def fct_orders():
    get_orders() # gets data from all time
```

Define a partition



assets.py

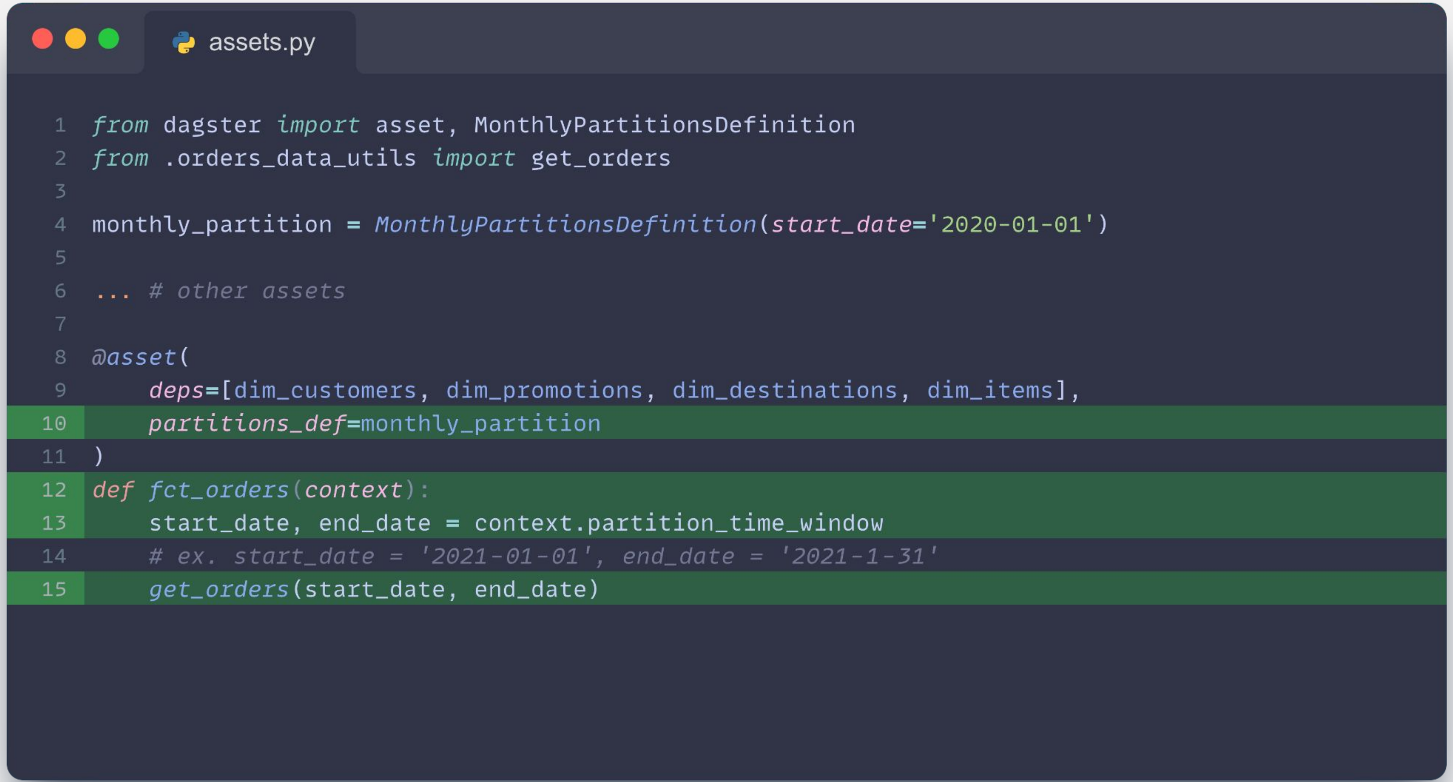
```python
from dagster import asset, MonthlyPartitionsDefinition
from .orders_data_utils import get_orders

monthly_partition = MonthlyPartitionsDefinition(start_date='2020-01-01')

... # other assets

@asset(
    deps=[dim_customers, dim_promotions, dim_destinations, dim_items],
)
def fct_orders():
    get_orders() # gets data from all time
```

After


assets.py

```python
from dagster import asset, MonthlyPartitionsDefinition
from .orders_data_utils import get_orders

monthly_partition = MonthlyPartitionsDefinition(start_date='2020-01-01')

... # other assets

@asset(
    deps=[dim_customers, dim_promotions, dim_destinations, dim_items],
    partitions_def=monthly_partition
)
def fct_orders(context):
    start_date, end_date = context.partition_time_window
    # ex. start_date = '2021-01-01', end_date = '2021-1-31'
    get_orders(start_date, end_date)
```

Run It

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A **partitioned asset** is a collection of smaller assets that share the same definition

StaticPartitionDefinition can be used for categorical data

MonthlyPartitionDefinition can be used for continuous time data

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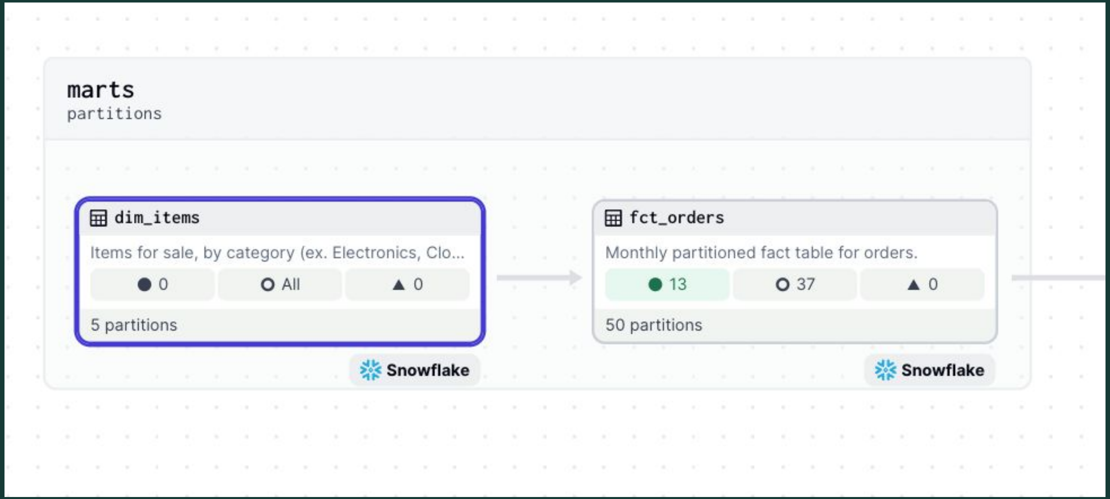
marts
partitions
dim_items
Items for sale, by category (ex. Electronics, Clo...
● 0
○ All
▲ 0
5 partitions
Snowflake
fct_orders
Monthly partitioned fact table for orders.
● 13
○ 37
▲ 0
50 partitions
Snowflake

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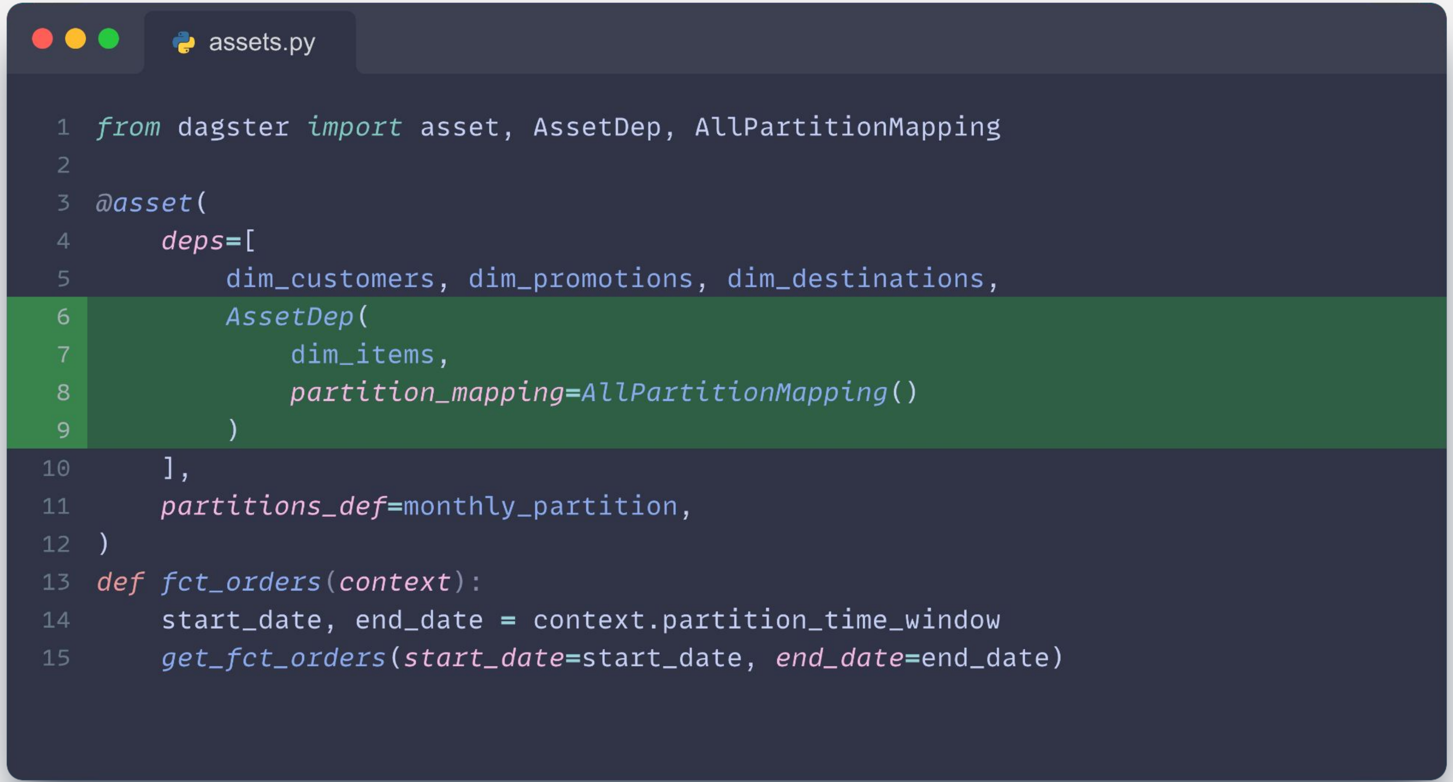
Partition Mappings configure how assets depend on partitioned assets

This lets you express dependencies like:

- Depend on all partitions
- Depend on the same partition as itself
- Depend on a specific set of partitions
- etc.

Configure a dependency

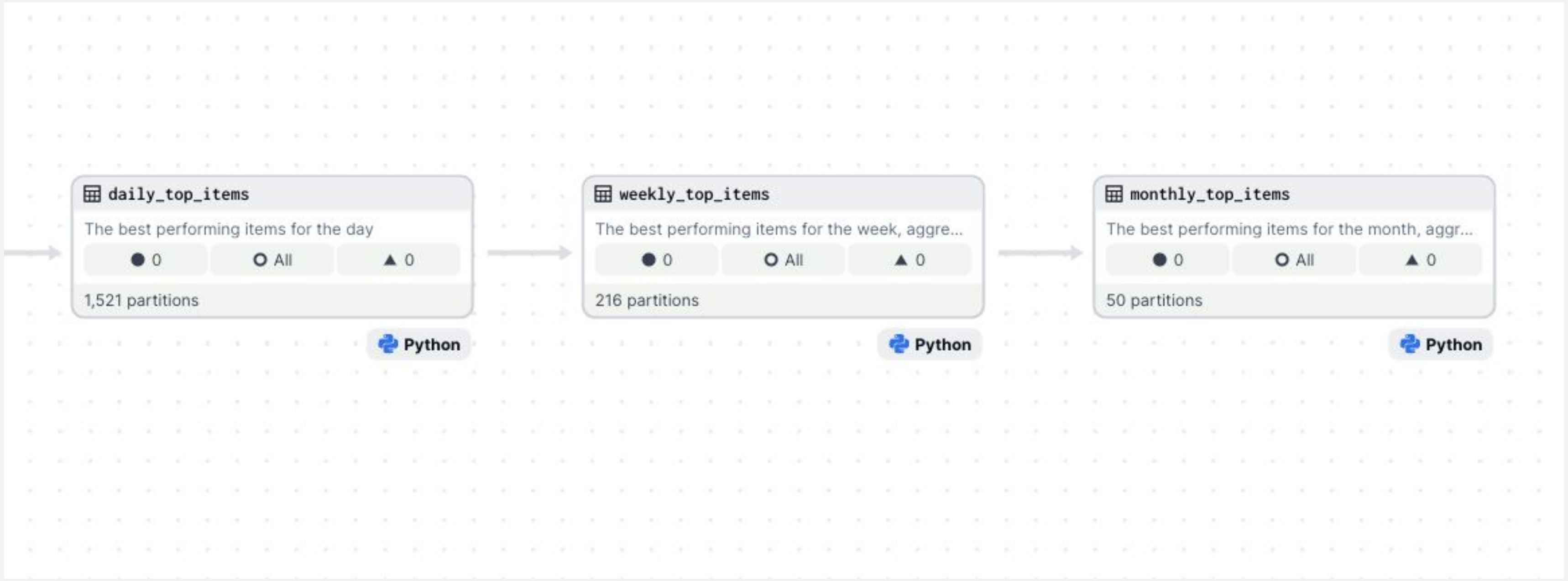


assets.py

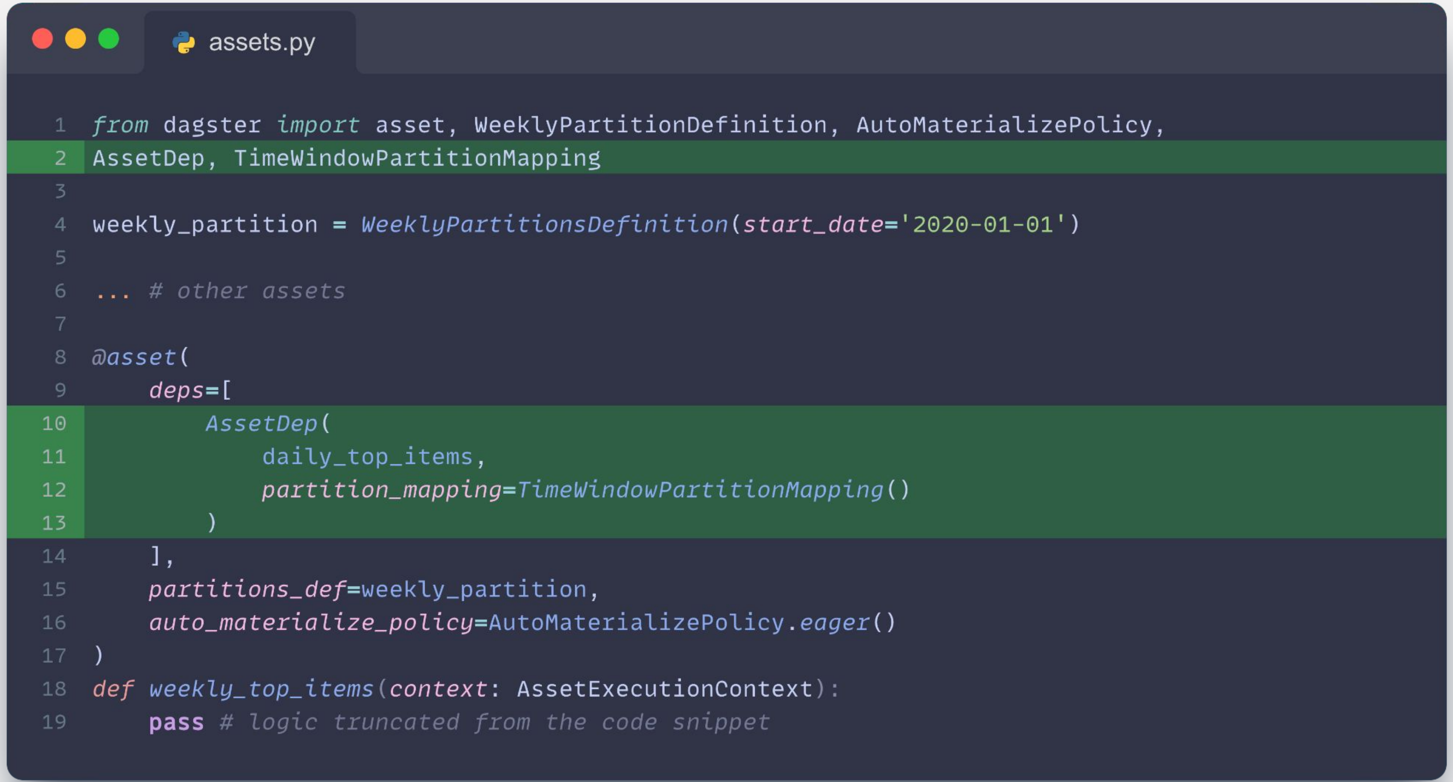
```python
from dagster import asset, AssetDep, AllPartitionMapping

@asset(
    deps=[
        dim_customers, dim_promotions, dim_destinations,
        AssetDep(
            dim_items,
            partition_mapping=AllPartitionMapping()
        )
    ],
    partitions_def=monthly_partition,
)
def fct_orders(context):
    start_date, end_date = context.partition_time_window
    get_fct_orders(start_date=start_date, end_date=end_date)
```

Partitions depending on certain partitions



Define a partition



assets.py

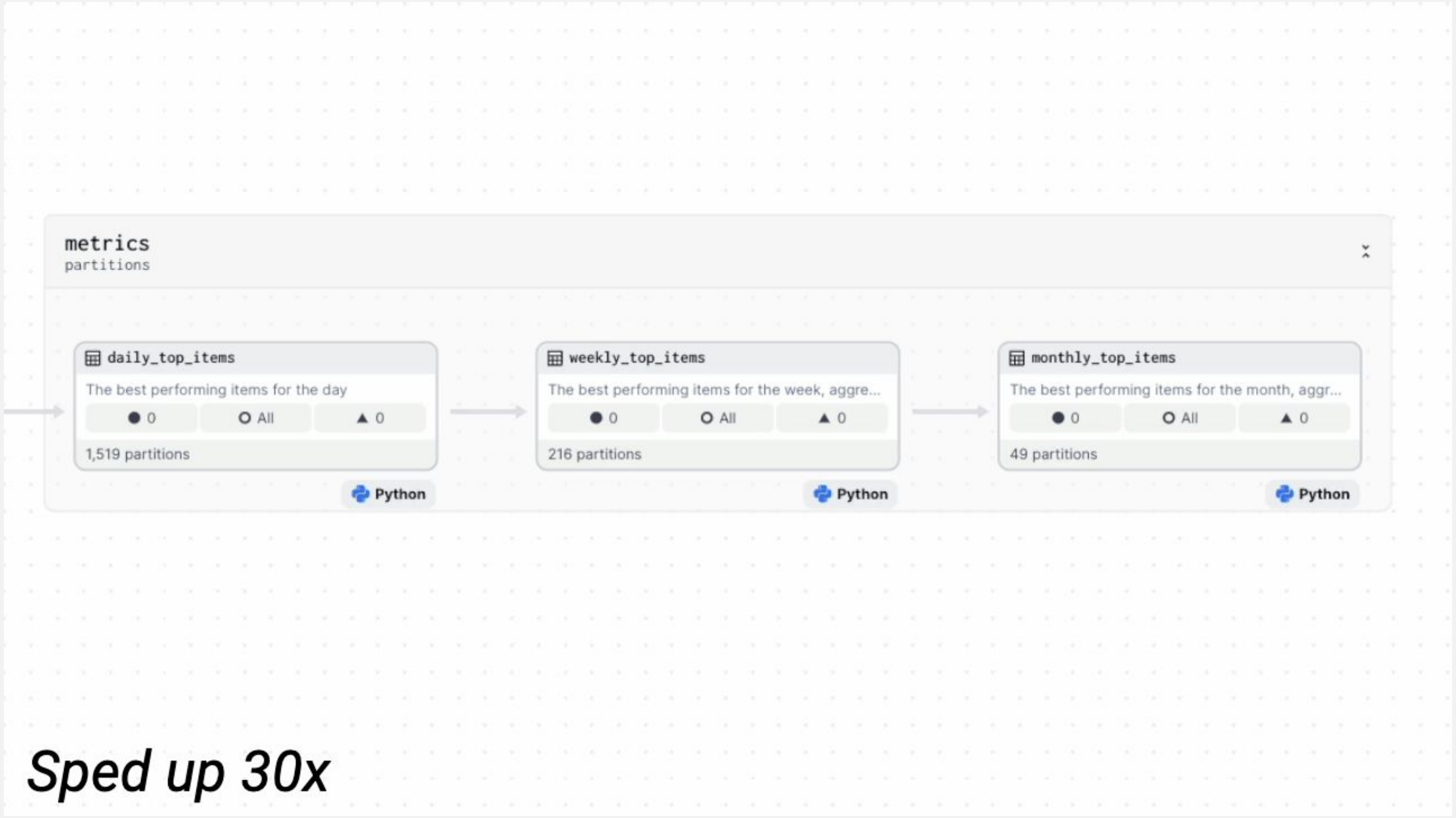
```python
from dagster import asset, WeeklyPartitionDefinition, AutoMaterializePolicy,
AssetDep, TimeWindowPartitionMapping

weekly_partition = WeeklyPartitionsDefinition(start_date='2020-01-01')

... # other assets

@asset(
    deps=[
        AssetDep(
            daily_top_items,
            partition_mapping=TimeWindowPartitionMapping()
        )
    ],
    partitions_def=weekly_partition,
    auto_materialize_policy=AutoMaterializePolicy.eager()
)
def weekly_top_items(context: AssetExecutionContext):
    pass # logic truncated from the code snippet
```

And here it is



Sped up 30x

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Partition Mappings configure how an asset depends on a partitioned asset

You have many mappings available to you, ex. `AllPartitionMapping`, `TimeWindowPartitionMapping`, `IdentityPartitionMapping`, `LastPartitionMapping`, etc.

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Partitioning data makes pipelines faster and cheaper

Dagster has great native support for partitions

How downstream assets depend on partitions is configurable

Next steps & resources

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