Yandex

Data modeling and file formats

Storage:
HDFS

Application:
Real-time bidding
platform

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Data = Clicks, Impressions

Task = Compute CTR

Domain-specific terms

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In-between

Data model,
File formats

Data modeling

- Data model – a way you think about your data elements, what they are, what domain they come from, how different elements relate to each other, what they are composed of

  - abstract model
  - explicitly defines the structure of data

Relational data model

C1	C2	C3	C4
v11	v12	v13	v14
v21	v22	v23	v24
v31	v32	v33	v34

Relational data model

Data set
(also: table, relation)

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Relational data model

Data set
(also: table, relation)

Tuples
(also: rows)

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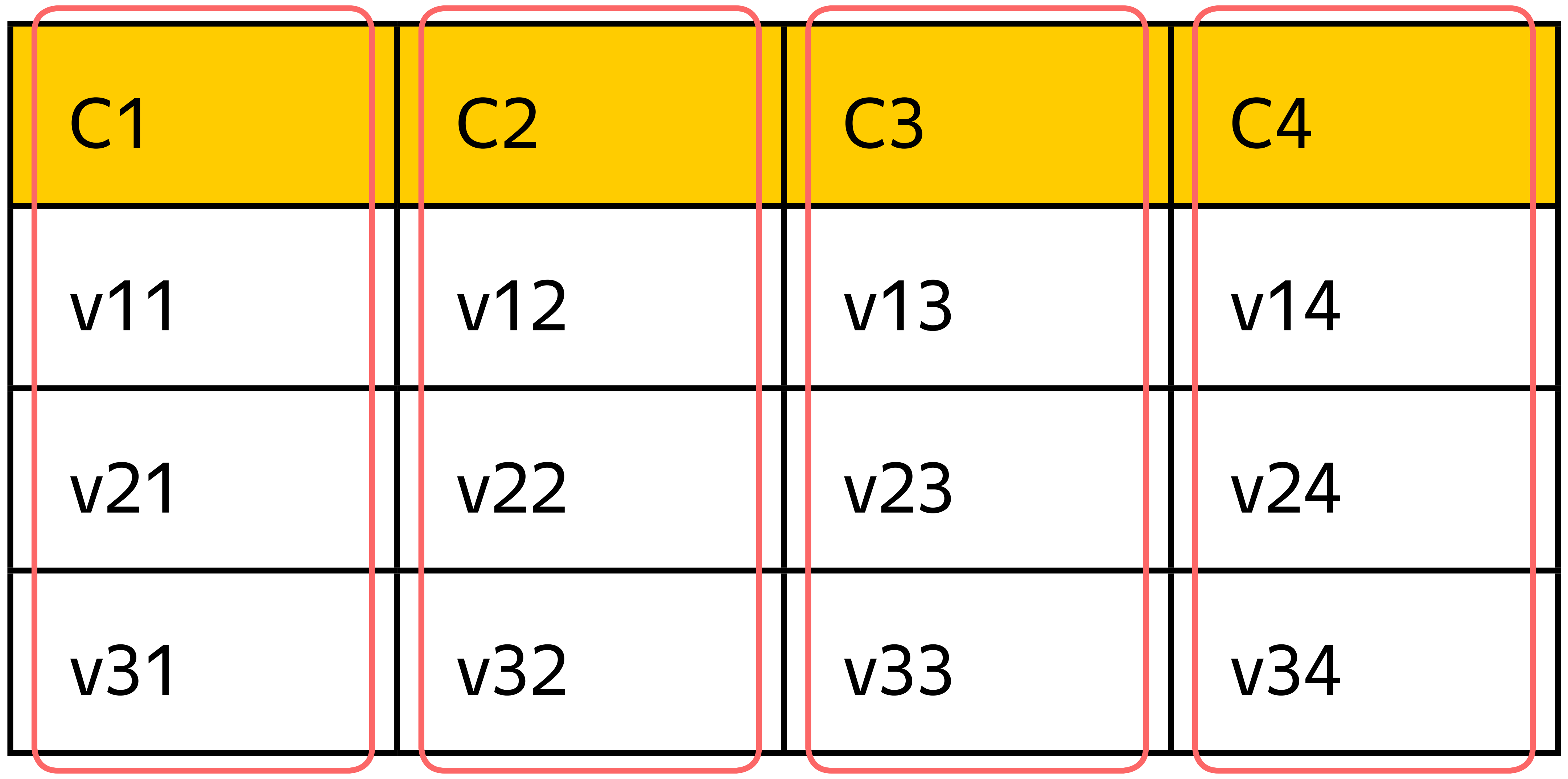
Relational data model

Data set
(also: table, relation)

Tuples
(also: rows)

Columns
(also: attributes)



C1	C2	C3	C4
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Relational data model

Data set
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Tuples
(also: rows)

Columns
(also: attributes)

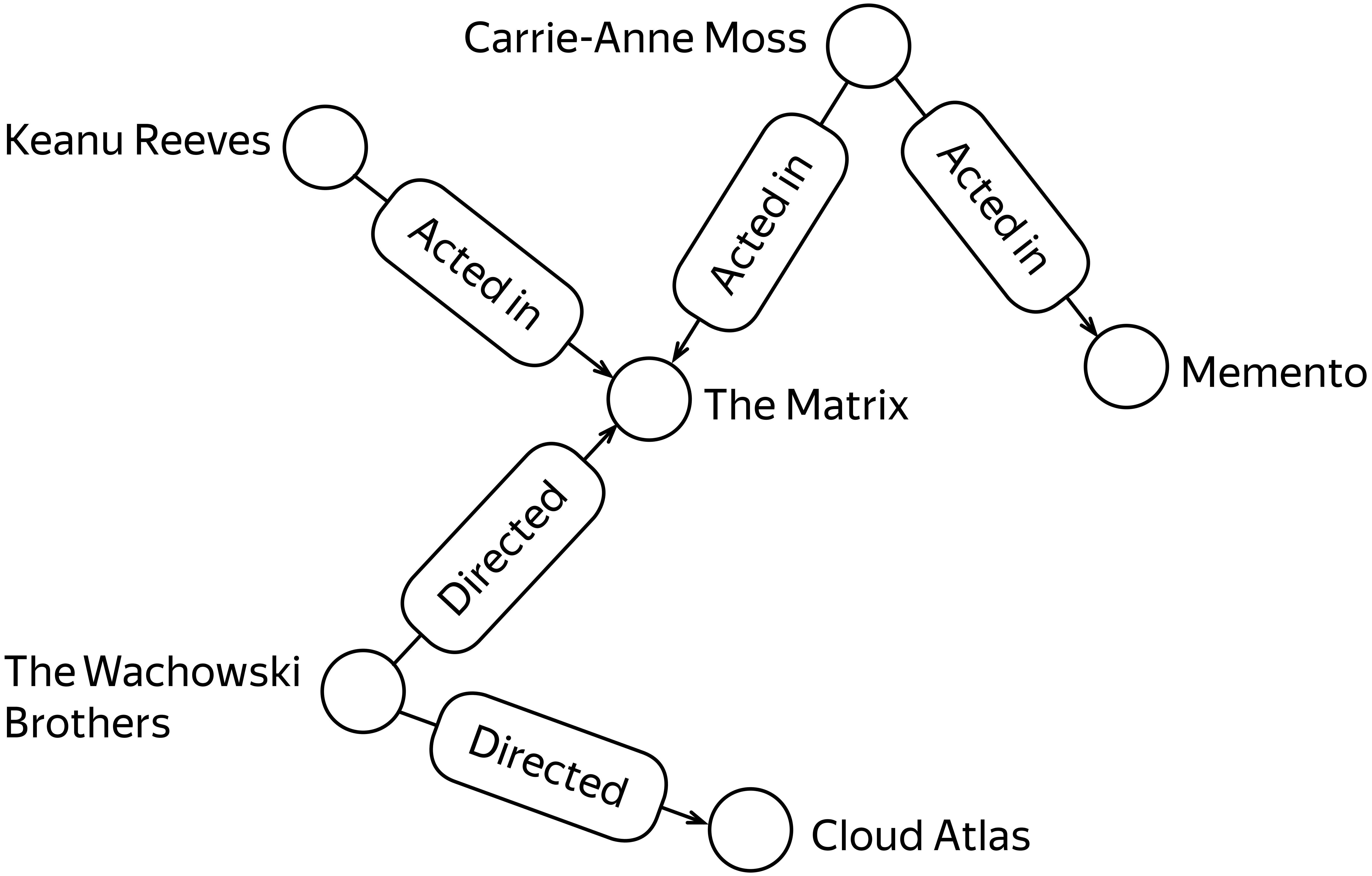
Values

C1	C2	C3	C4
v11	v12	v13	v14
v21	v22	v23	v24
v31	v32	v33	v34

Relational data model (example)

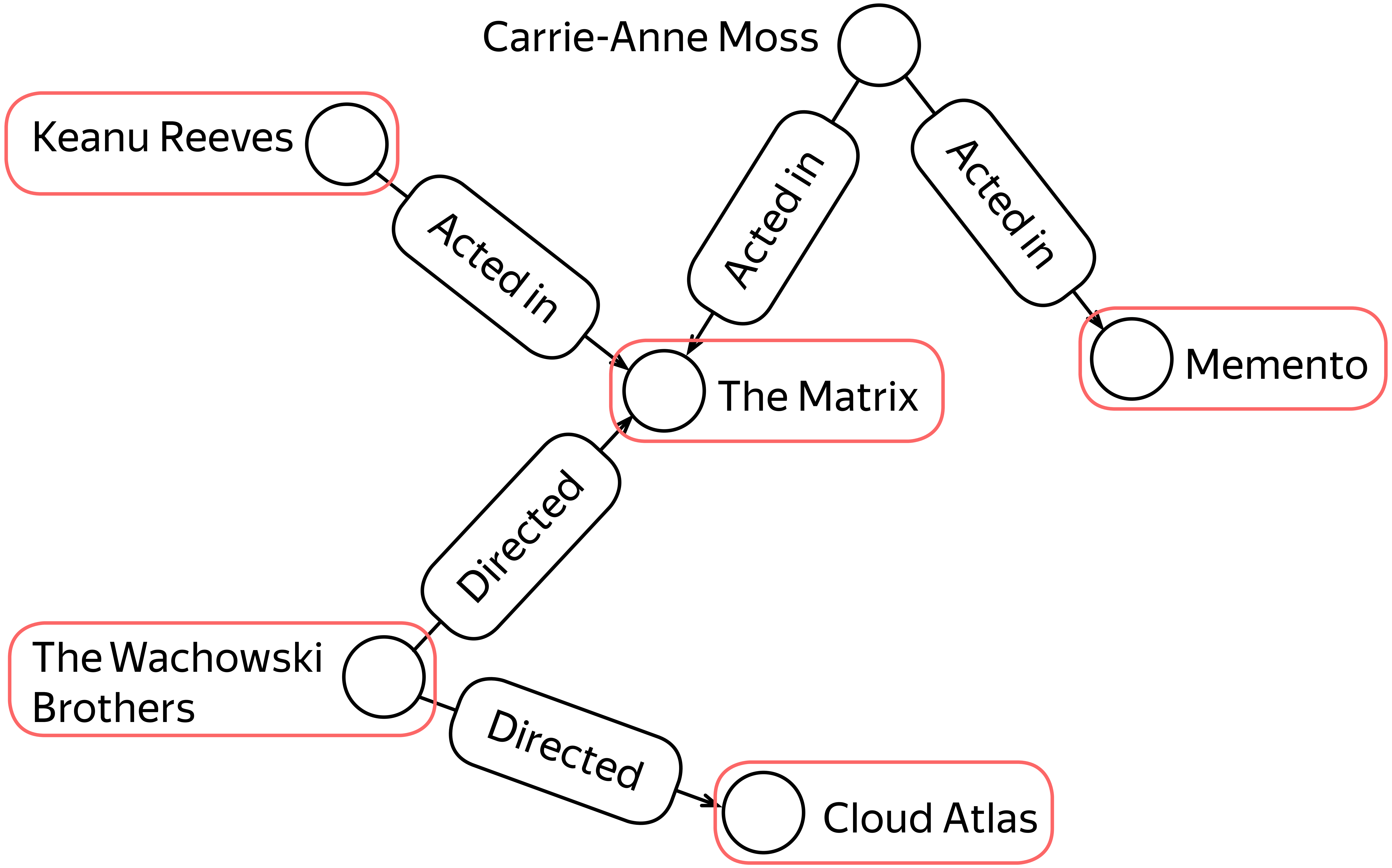
Event	Timestamp	User ID	Ad ID
IMPRESSION	T21:04:13	u1248	a864
IMPRESSION	T21:04:15	u3192	a711
CLICK	T21:04:20	u3192	a711

Graph data model



Graph data model

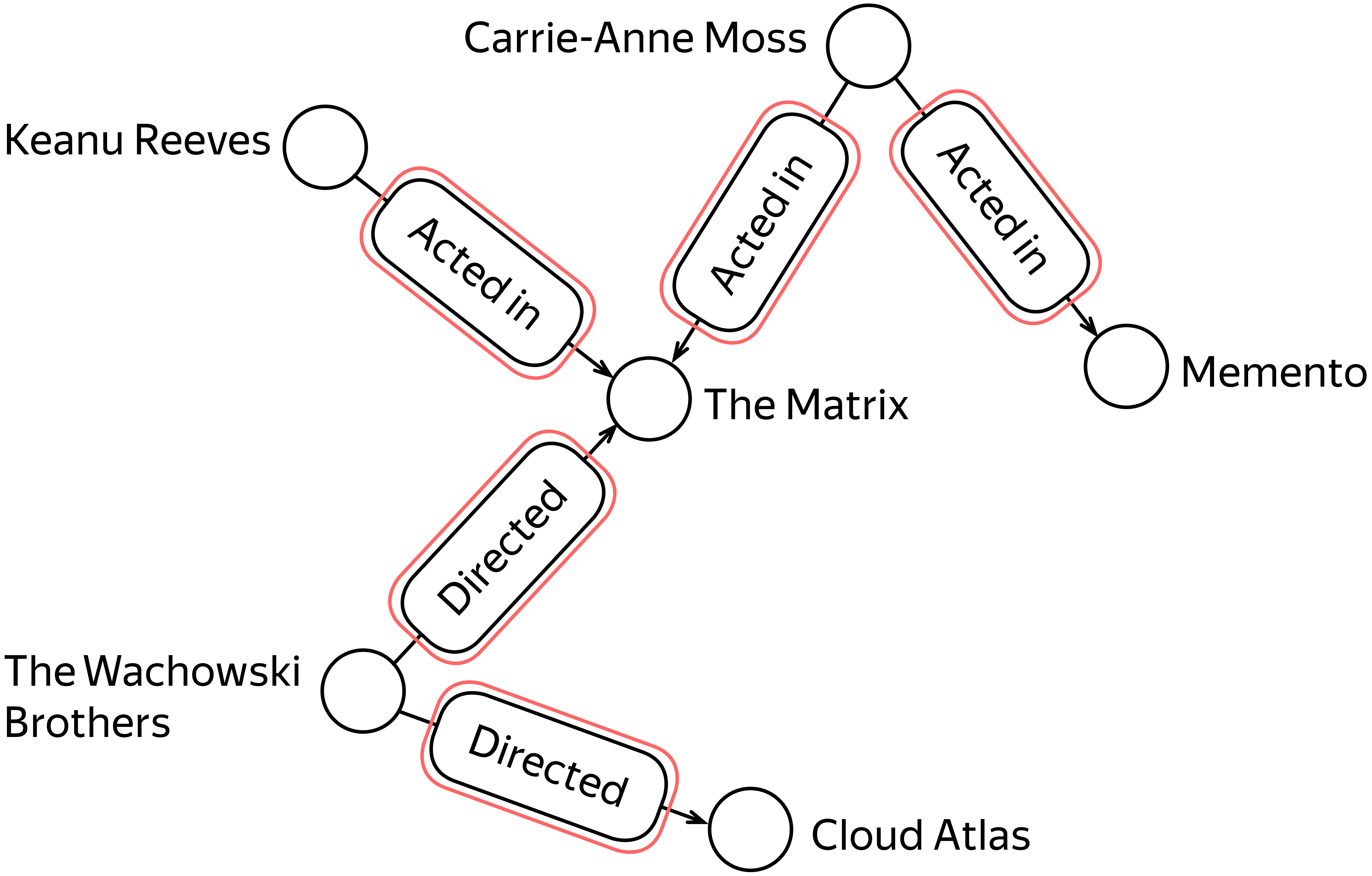
Vertices
(also: entities)



Graph data model

Vertices
(also: entities)

Edges
(also: relations)



Data model

- Defines the structure of data
- Makes some things easier to express than others
- Will use a *relational model*

Unstructured data?

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- Ex. 1: Logs = Line per request with all related data
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- Ex. 2: Video = Sequence of frames
  - Hard to work with

File format (also: storage format)

- Defines (physical) data layout
- Different design choices lead to different tradeoffs in complexity
  - affects performance, correctness

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- Different design choices lead to different tradeoffs in complexity
  - affects performance, correctness

- Primary function: to transform between raw bytes and programmatical data structures (*serialization* & *deserialization*)

File formats

- Many!
- Differ in:
  - space efficiency
  - encoding & decoding speed
  - supported data types
  - splittable/monolithic structure
  - extensibility

Conclusion

- Deciding on a *data model* and *storage format* have far-reaching implications for your application performance, correctness, computation complexity, and resource usage

- Next videos
  - Text formats
  - Binary formats
  - Compression

BigDATAteam