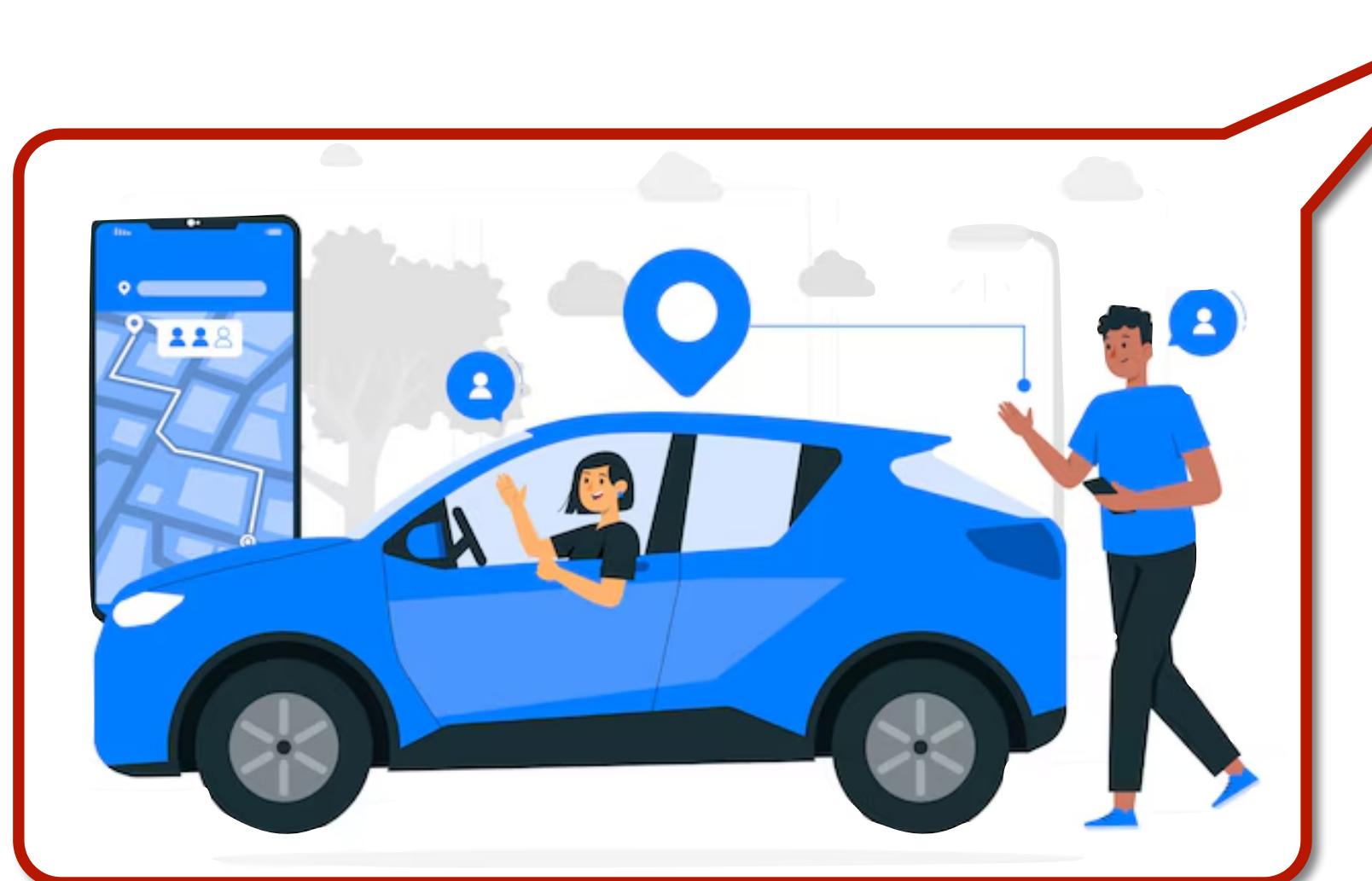


**TECH
VAULT**

OLTP vs OLAP DATABASES



AMR ELHELW



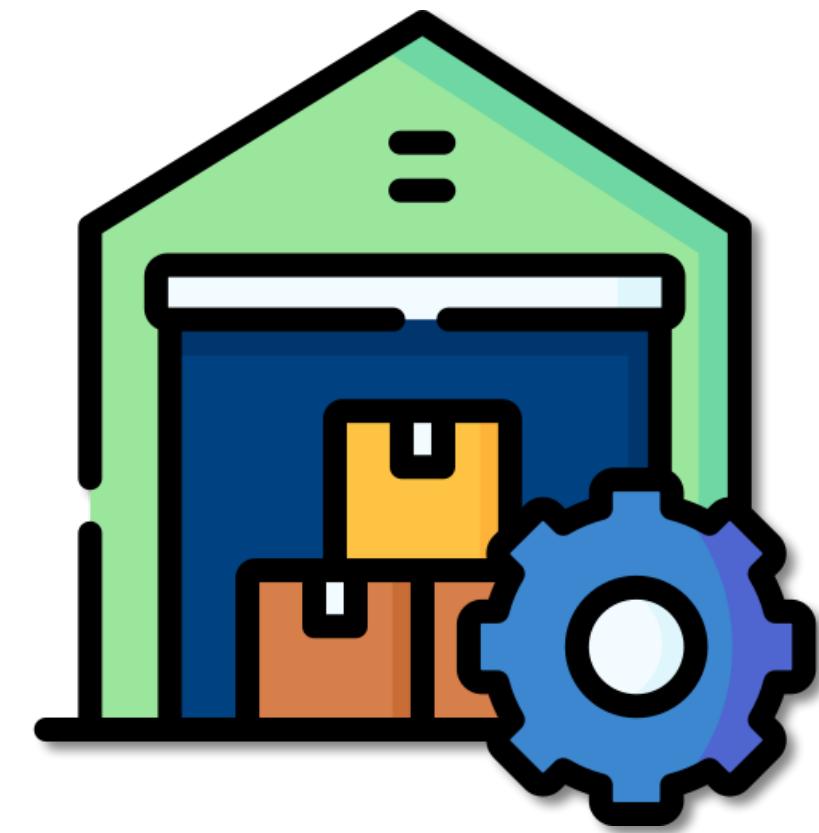
OLTP ←



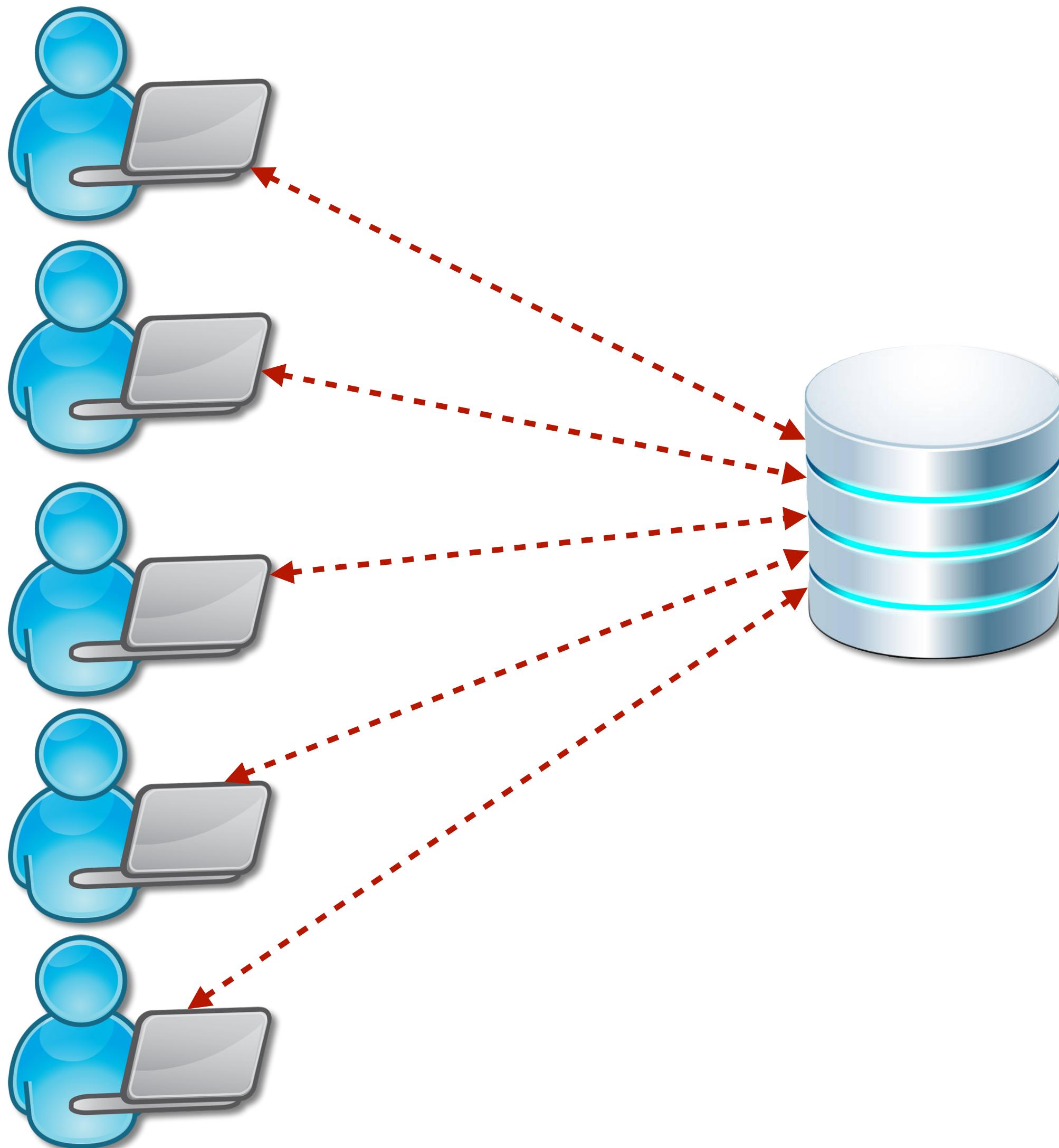
→ **OLAP**

OnLine Transactional Processing

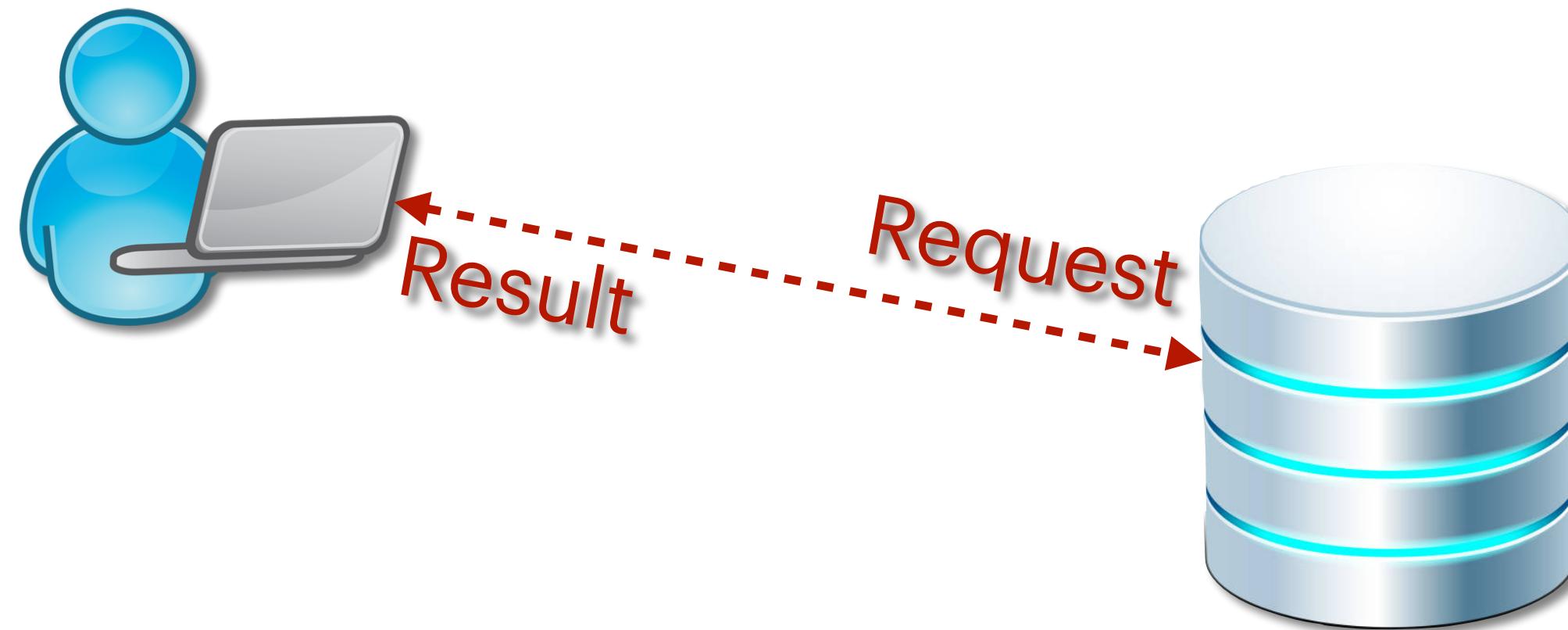
Systems handling daily operational tasks



OnLine Transactional Processing



OnLine Transactional Processing



Banking

- Check account balance (read)
- Deposit \$100 (update)

Social media

- Read comments (read)
- Like a post (update)

Shopping

- Search for some product (read)
- Check out cart (update)

OnLine Transactional Processing

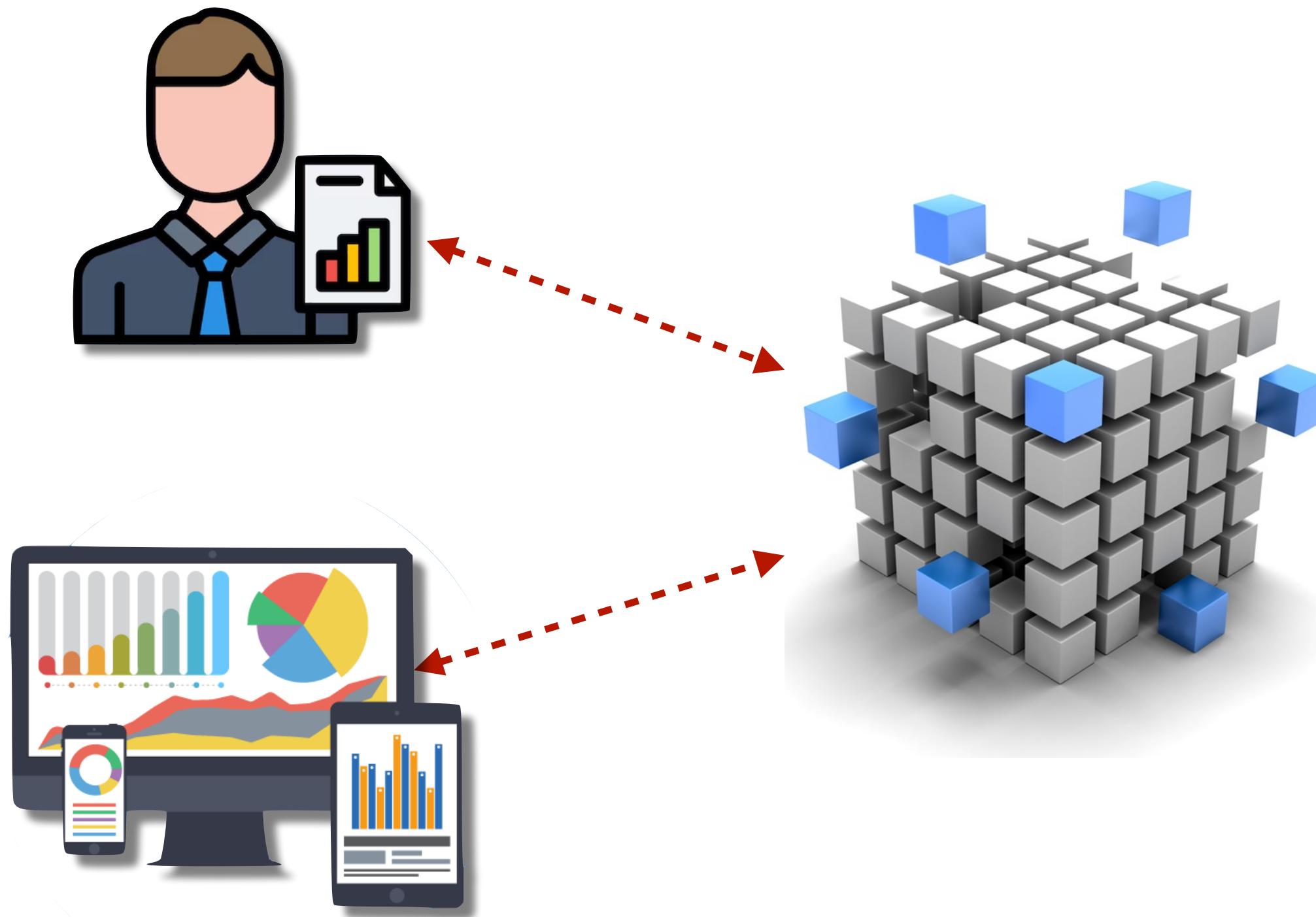
- Current operational data
- Day to day operations
- Many concurrent users (customers, employees)
- Short and simple requests
- Fast response time
- Read/write operations

OnLine Analytical Processing

- Systems analyzing large amounts of historical and aggregated data
- The DB part of an OLAP system → Data Warehouse

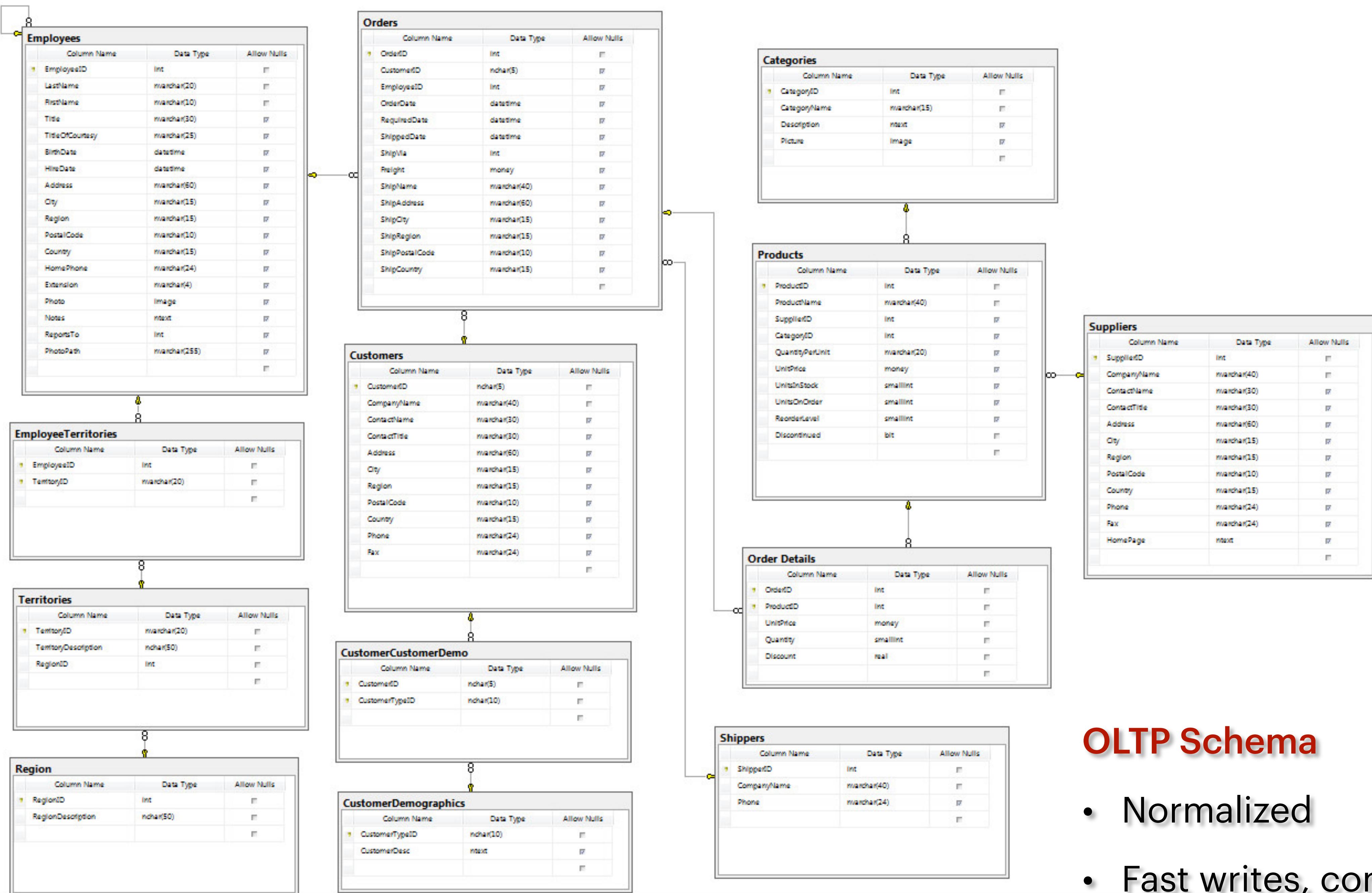


OnLine Analytical Processing



OnLine Analytical Processing

- Historical and/or aggregated data
- Analytics, trends, insights into data
- Analysts, Data scientists, BI tools
- Complex and multidimensional queries
- Longer response time
- Read-only operations



OLTP Schema

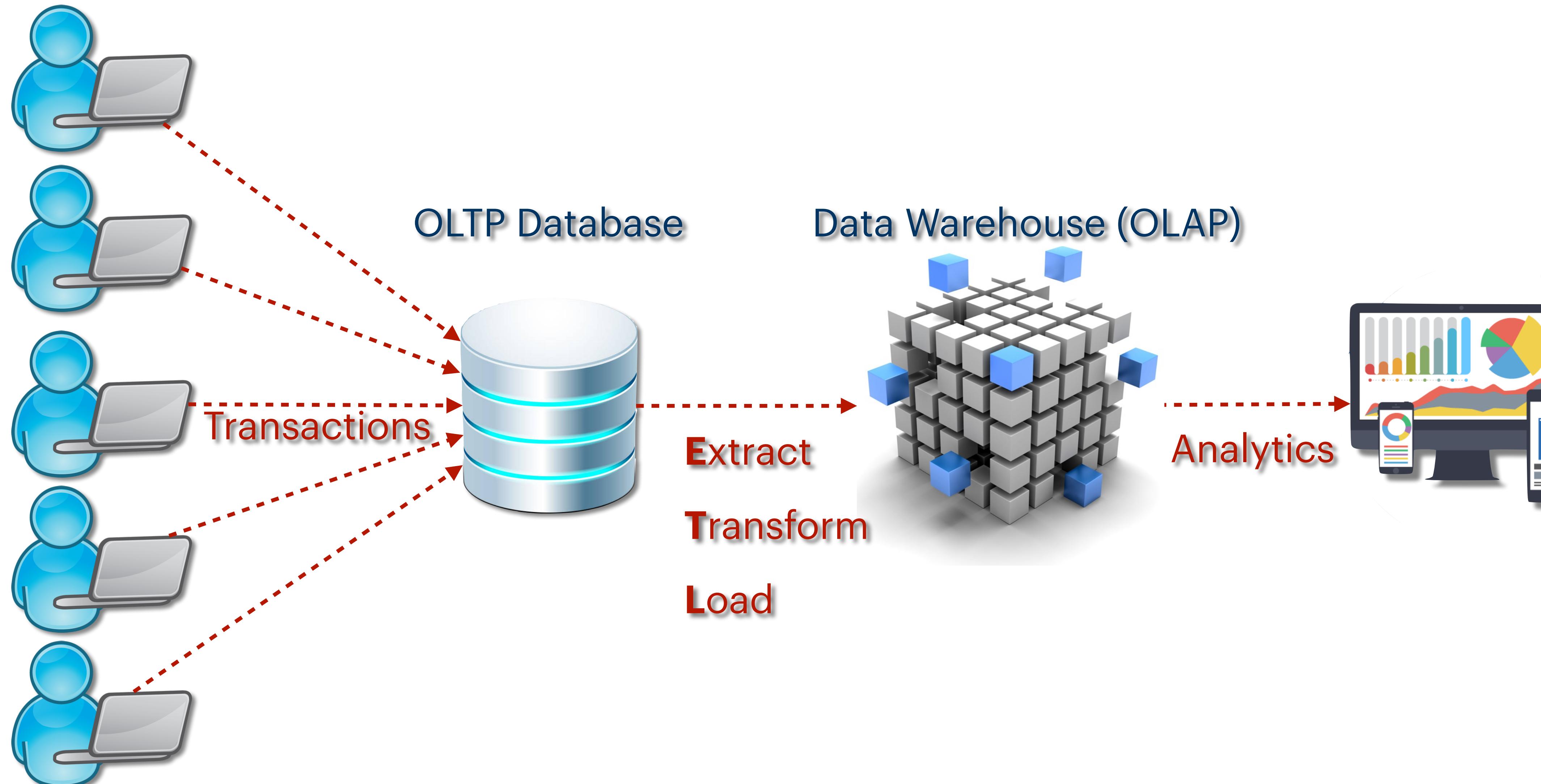
- Normalized
- Fast writes, consistent

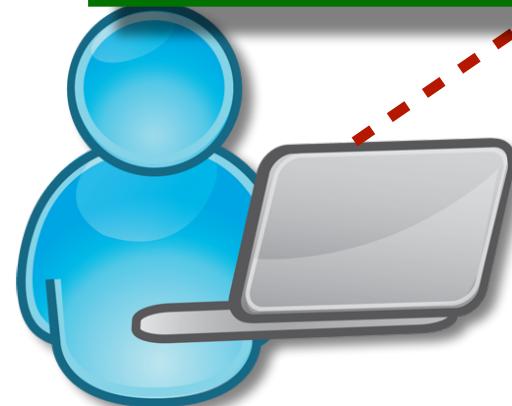
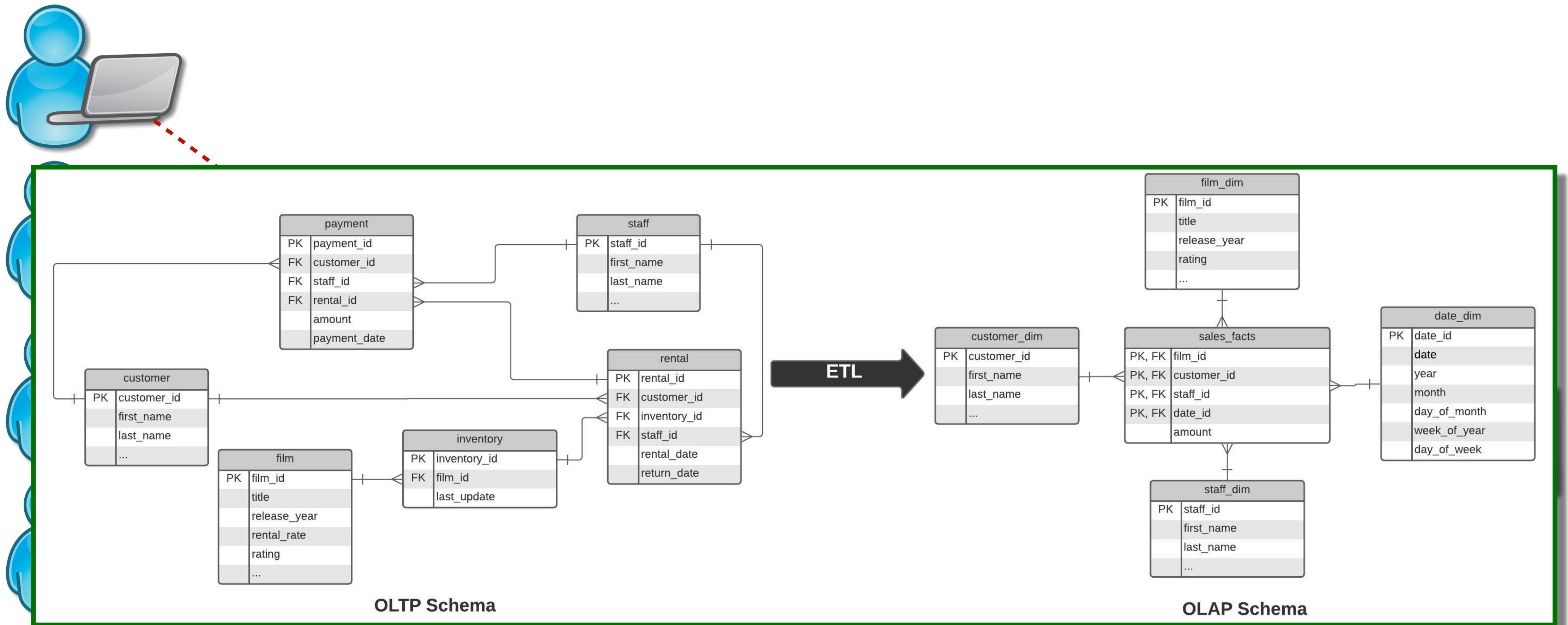


data_key	territory_key	employee_key	store_key	individual_customer_key	sales_order_number	online_order_flag	sale_subtotal	tax_amount	shipping_cost
20231001	1	101	5	2001	SO10001	1	150	12	10
20231001	2	102	4	2001	SO10002	0	1200	96	30
20231002	1	103	3	2009	SO10003	1	75	6	5
20231002	3	104	3	2008	SO10004	0	3000	240	50
20231003	2	105	2	2008	SO10005	0	850	68	20
20231003	3	106	2	2008	SO10006	1	200	16	15
20231004	3	107	1	2005	SO10007	0	4000	320	40
20231005	2	108	1	2001	SO10008	1	600	48	25
20231005	1	109	4	2008	SO10009	0	950	76	22
20231006	2	110	5	2005	SO10010	1	300	24	18

Star Schema (OLAP)

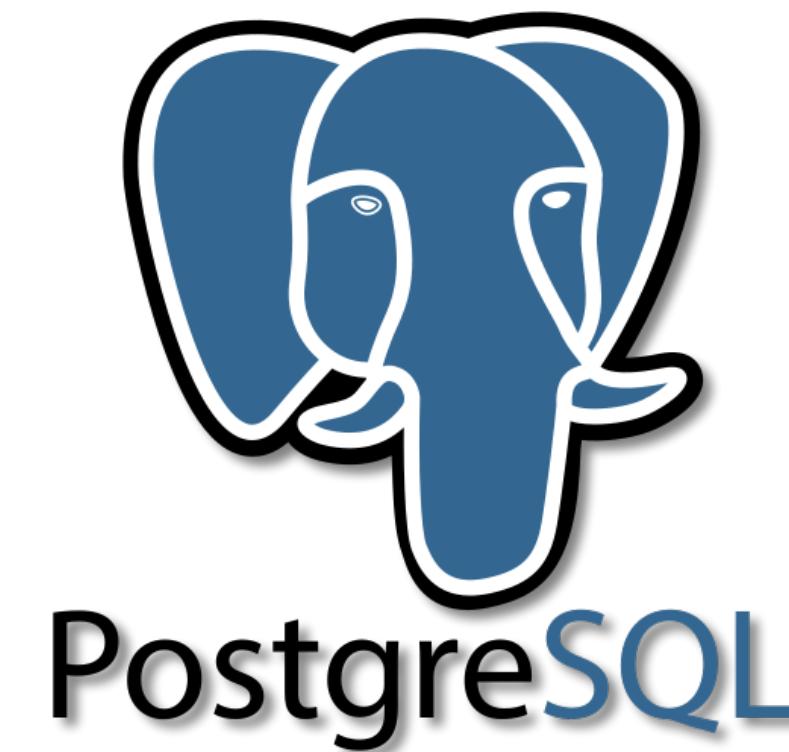
- Denormalized
- Fact table and multiple “dimension” tables





OLTP-focused DBMS

- ACID compliance
- Real-time performance
- High concurrency
- Scalability with high write loads (sharding, replication)



OLAP-focused DBMS

- Manage large datasets efficiently (partitioning, columnar storage)
- Support for complex, multidimensional queries
- Powerful query optimizer
- Optimized for aggregations, analytical functions, etc.



Google
Big Query



	OLTP	OLAP
Purpose	Transactional, Operational	Analytical, decision making
Data	Current	Historical
Users	End users (customers, employees)	Analysts
Data access	Read/Write	Read only
Queries	Simple reads and updates	Complex queries with joins, aggregation and analytical functions
Schema Design	Normalized	Denormalized (star or snowflake schema)