

Architecture Spotlight:
Vertical Markets | The Consumer Web

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Preliminary – Not for Publication

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Real-Time Data Platform

- Declaratively specify applications
- Synthesize streaming data from many sources
- Scale efficiently and massively

Static Model

- Batch updates
- Standardized reports
- Real-time analytics

Dynamic Model

- Huge transaction volumes
- Data science and complex analytics produced in real time
- User-driven, on-demand reporting
- Network effects

Pioneers

- Google
- Facebook
- Netflix
- Amazon

New Technologies

- NoSQL and graph databases
- Cloud computing
- Small, scalable servers
- Fault tolerance

Data Flow – Consumer Site

User Actions

- Page Views
- Searches
- Purchases
- Uploads

User Content

- Stories
- Suggestions
- Ads

Analytics

- Trends
- Clustering
- Profiles
- Histories

External Events

- News Reports
- Market Movements
- Product Offerings

Reports

- Content Refinement
- Usage Statistics
- Revenue

Data Flow – Finance

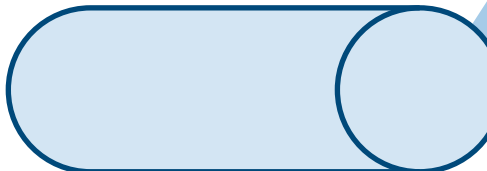
Live and Static Trade Data

ID	Book	Security	NbShares
	18579	ORCL	220
1	2142039	COST	8423
2	12145	ALTR	3520
3	21121	AKAM	10020
4	2036915	AAPL	3383
5	2055103	VMED	4954
6	15316	CMCSA	8461

Streaming Market Data

ID	Security	Bid	Ask
	ATVI	63.90	64.05
1	ADBE	14.55	16.52
2	AKAM	340.20	341.49
3	ALXN	5.37	6.86
4	ALTR	443.04	444.54
5	AMZN	59.82	60.94
6	AMGN	60.29	60.82

Static Reference Data



*Huge user base,
diverse needs*

*Live, rich, big
interactive reports*

RDx Explorer (HTML5 Grid)

RDx Explorer

HPivotView

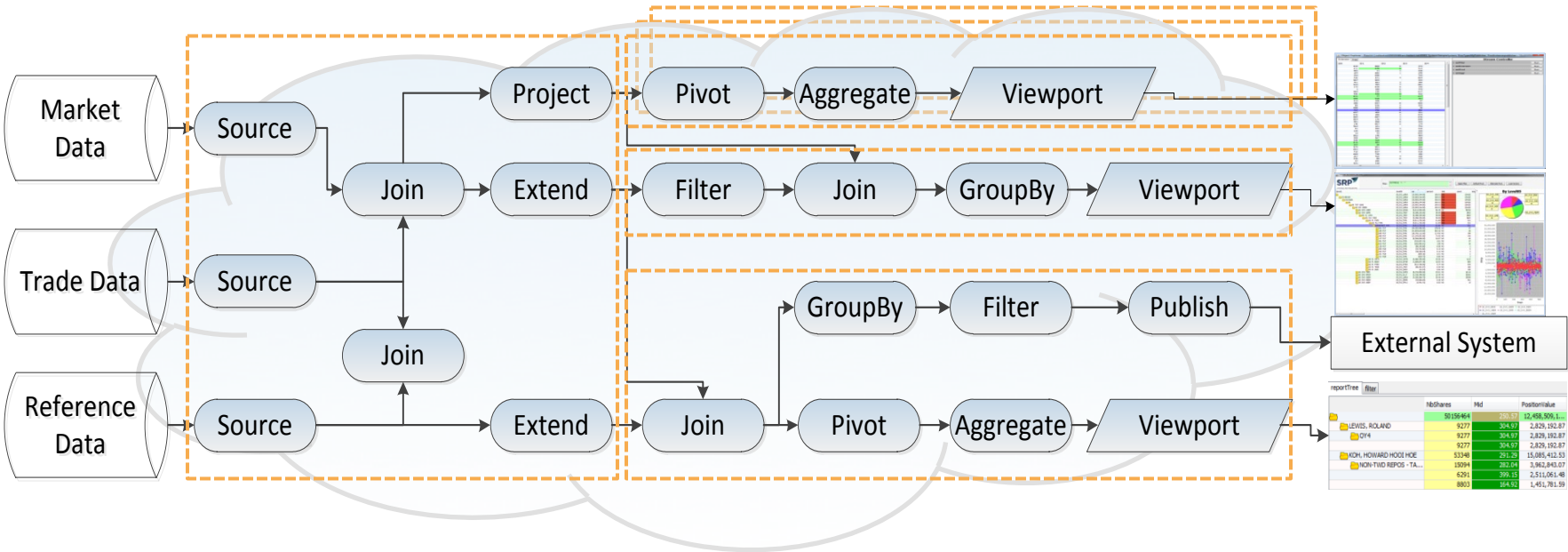
Expand All Collapse All Share Actions

[Book_Name...	Book_Name	Book_Trader	PositionV...	ADJ	BNK	CAP	EXP	TRD	BookCategory	BusinessCon...
			11,872,362.70...	2,598,347.538...	1,093,908.906...	171,346,019.46	4,416,337.77	8,004,343.906...		
PE for Cl...	PE for Cluster...		9,377,399.99	0.00	0.00	9,377,399.99	0.00	0.00	25CC	
JPY Repo	JPY Repo		1,178,053.12	0.00	0.00	0.00	0.00	1,178,053.12	QVC0	
ECM Hon...	ECM Hong Ko...		6,962,748.95	6,962,748.95	0.00	0.00	0.00	0.00	30JG	
Investors...	Investors-DID		893,064.59	893,064.59	0.00	0.00	0.00	0.00	QEV0	
DNH HA...	DNH HACHIM...		747,734.32	0.00	0.00	0.00	0.00	747,734.32		
DIGB6 C...	DIGB6 CSFBI...		5,059,551.59	5,059,551.59	0.00	0.00	0.00	0.00	QC4U	
MTG1	MTG1		4,665,318.33	0.00	0.00	0.00	0.00	4,665,318.33	16B2	

Platform Elements

- Data capture and audit
- Grid calculation
- Real-time data flow
- Visualization

Real-Time Data Algebra



Real-Time Data Stream

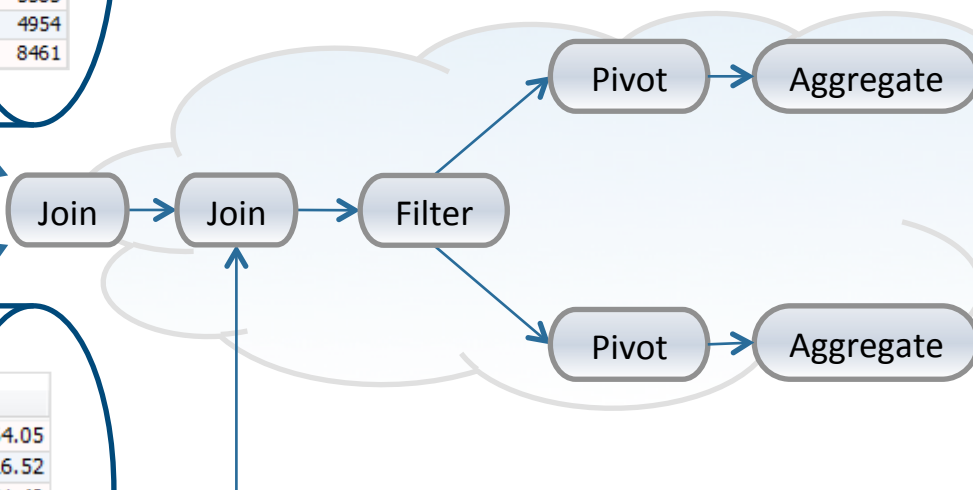
Trade Data

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Reference Data



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Benefits of Common Platform

- Rapid development
- Handles infrastructure complexities
- Ensures consistency

Commonalities with massively scaled Web sites

- Volume & Velocity
- Real-time decision-making
- Dynamic, flexible views
- Graph-like data model
- Use of open-source tools
- Synthesis of real-time data from many sources
- Failover, load balancing, fault tolerance

Advantages over consumer sites

- Well-defined problem space
- Steady feedback leads to tailored refinement
- Demanding, insightful users
- Techniques translate directly to large set of applications across industries



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Q&A