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Time Series DB

Should I use one in my application architecture?

Anais Dotis-Georgiou
Developer Advocate

LinkedIn

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Influx Data - At a glance

FOUNDED	**2013** San Francisco HQ, 180 FTE's, 67+ in technical functions
FOCUS	**Where developers build real-time applications** for IoT, Analytics and Cloud native services
DIFFERENCE	**One platform; one API across Multiple Clouds and On-Prem** Ingest, query, story using common tools regardless of architecture
OSS FOUNDATION	**1300+ Customers and 736,000 daily active OSS deployments;** Google , Cisco, SAP, Comcast, Tesla, Siemens, PTC, Honeywell, JP Morgan Chase
BUSINESS MODEL	**PLG Driven Usage and Subscription Model** Pay for what you use; Pay how you want. Credit card, cloud provider, annual contract

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You have probably used InfluxDB
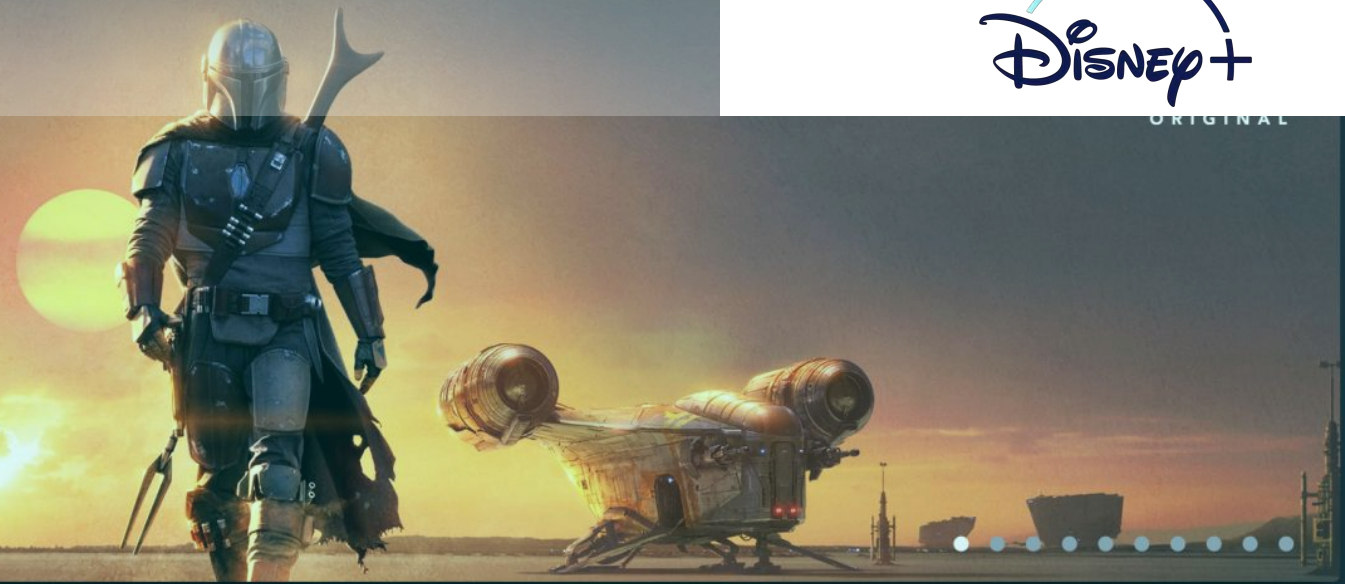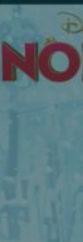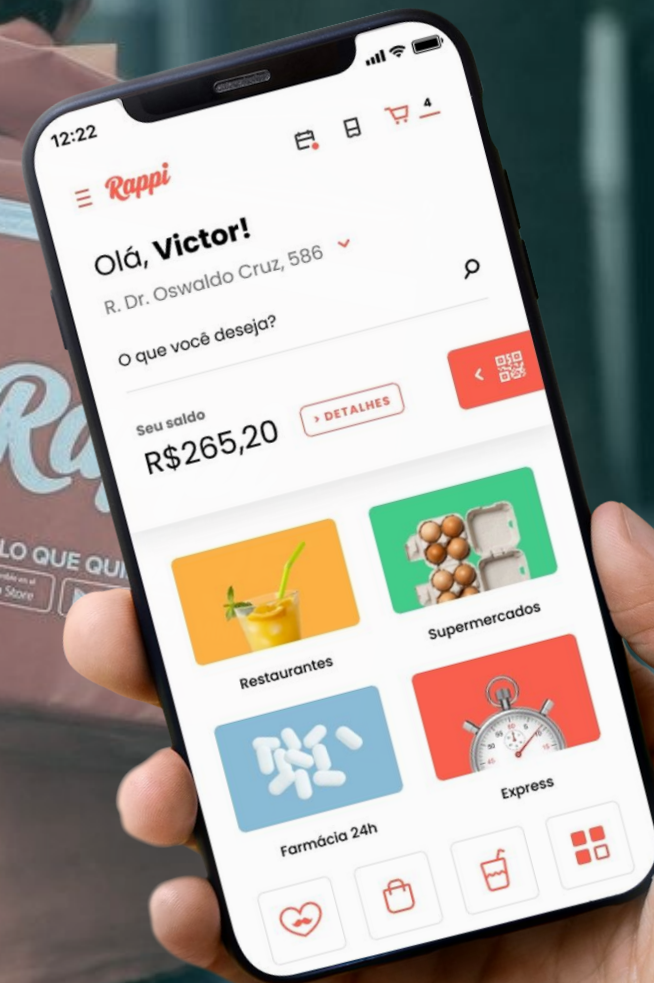
What is Time Series Data?

Time series data is a collection of observations obtained through repeated measurements over time

Time Series Example - Weather Station

December 27, 2022

Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.	UV	Solar
12:04 AM	69.7 °F	66.0 °F	88 %	ENE	1.0 mph	1.7 mph	29.96 in	0.00 in	0.00 in	0	0 w/m²
12:09 AM	69.6 °F	66.1 °F	89 %	ENE	1.0 mph	1.4 mph	29.97 in	0.00 in	0.00 in	0	0 w/m²
12:14 AM	69.6 °F	66.4 °F	89 %	ENE	1.0 mph	1.4 mph	29.96 in	0.00 in	0.00 in	0	0 w/m²
12:19 AM	69.7 °F	66.6 °F	90 %	ENE	0.9 mph	1.2 mph	29.96 in	0.00 in	0.00 in	0	0 w/m²
12:24 AM	69.7 °F	66.6 °F	90 %	ENE	0.5 mph	1.1 mph	29.97 in	0.00 in	0.00 in	0	0 w/m²
12:29 AM	69.7 °F	66.6 °F	90 %	East	0.7 mph	0.9 mph	29.96 in	0.00 in	0.00 in	0	0 w/m²
12:34 AM	69.7 °F	66.6 °F	90 %	East	0.9 mph	1.4 mph	29.97 in	0.00 in	0.00 in	0	0 w/m²
12:39 AM	69.9 °F	66.8 °F	90 %	East	0.8 mph	1.4 mph	29.96 in	0.00 in	0.00 in	0	0 w/m²
12:44 AM	70.0 °F	66.9 °F	90 %	East	0.4 mph	0.9 mph	29.96 in	0.00 in	0.00 in	0	0 w/m²
12:49 AM	70.1 °F	67.0 °F	90 %	East	0.3 mph	0.4 mph	29.97 in	0.00 in	0.00 in	0	0 w/m²
12:54 AM	70.1 °F	67.0 °F	90 %	ENE	0.4 mph	0.7 mph	29.96 in	0.00 in	0.00 in	0	0 w/m²
12:59 AM	70.2 °F	67.1 °F	90 %	East	0.3 mph	0.6 mph	29.96 in	0.00 in	0.00 in	0	0 w/m²

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Time Series Example - Weather Station

Summary
December 27, 2022

	High	Low	Average
Temperature	70.2 °F	67.1 °F	68.6 °F
Dew Point	67.1 °F	62.6 °F	64.9 °F
Humidity	92 %	83 %	88 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	3.1 mph	0.0 mph	1.4 mph
Wind Gust	4.5 mph	--	1.9 mph
Wind Direction	--	--	ENE
Pressure	29.97 in	29.91 in	--

December 27, 2022

Temperature (°F) Dew Point (°)

Wind Speed (mph) Wind Gust (mph)

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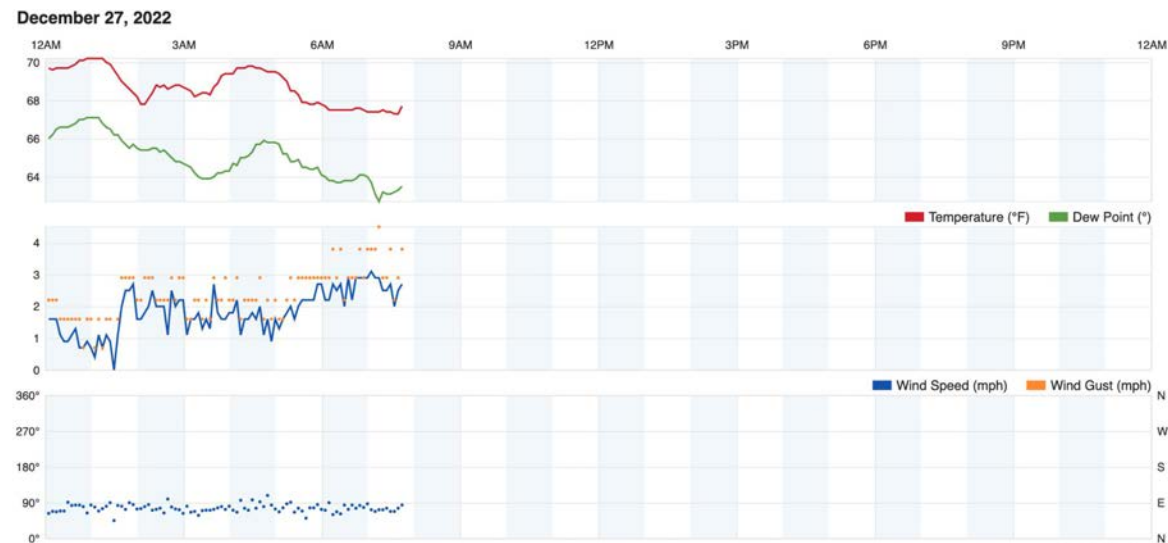
Time Series Example - Predictive Maintenance
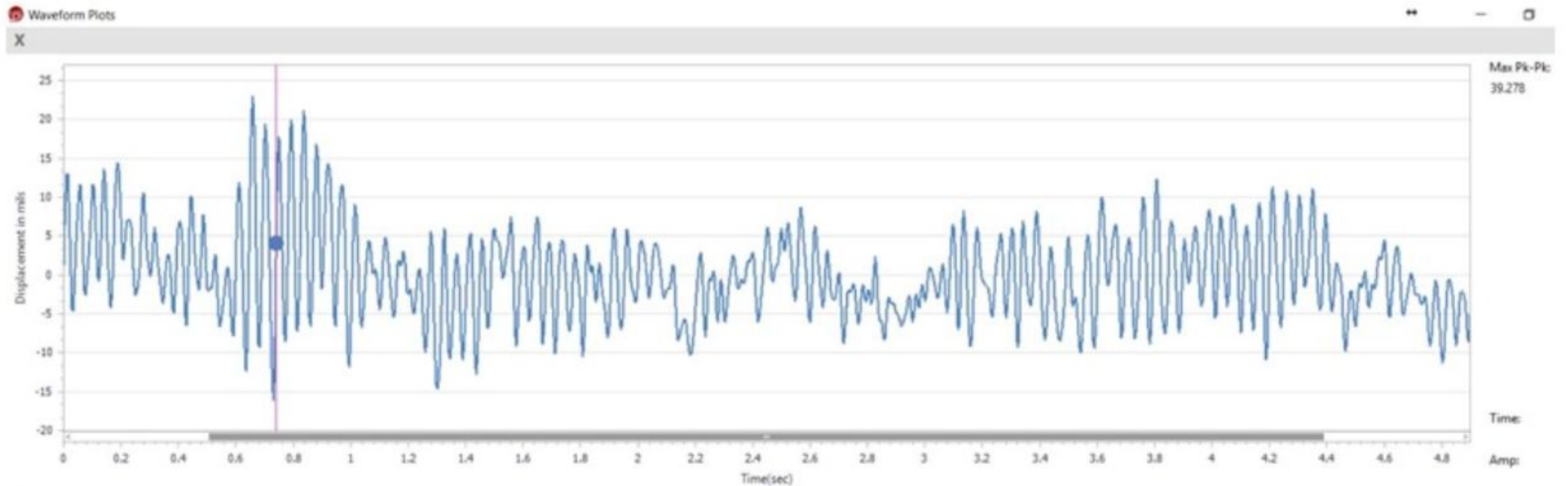
Time Series Example - Health Charting

Time	Pulse	Blood Pressure	Temperature
8:00am	65	120/80	98.6
8:30am	68	110/70	98.5
9:00am	70	112/72	98.5
9:30am	110	98/50	101.5
10:00am	82	120/75	99.2

Metrics and Events
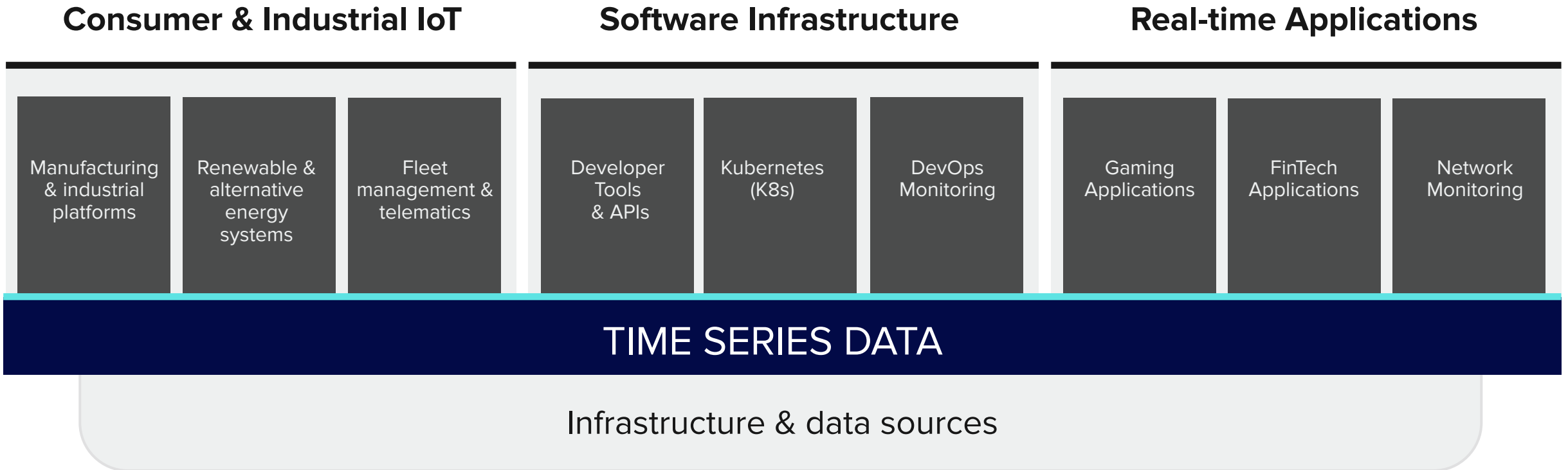
10 seconds
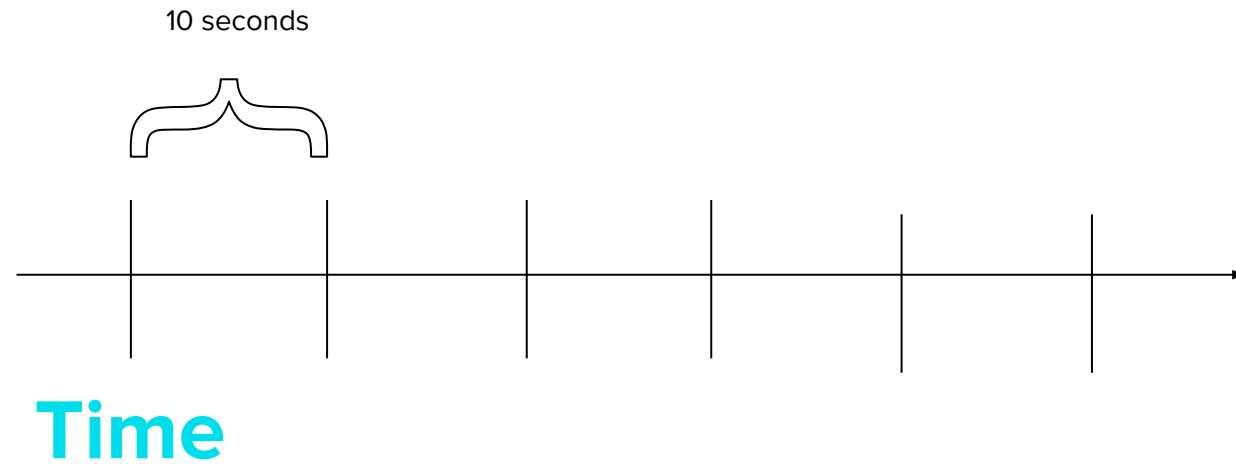
Time

Time

Metrics occur on regular time intervals
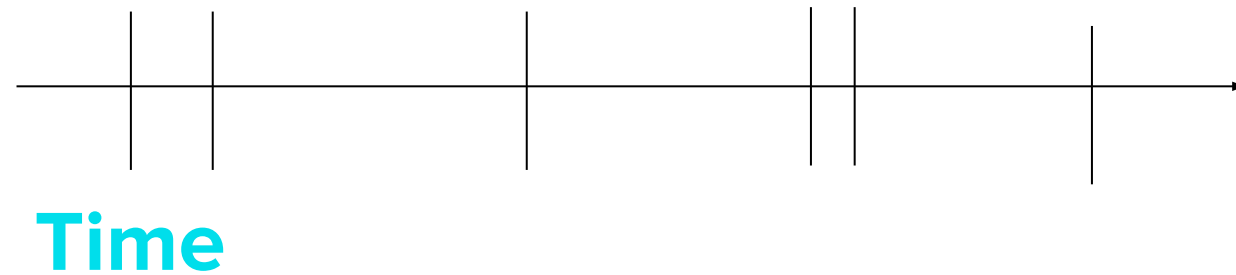
Events occur at specific points in time

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Why do we need time series databases?

Time series data is advancing in many areas

Consumer & Industrial IoT

- Manufacturing & industrial platforms
- Renewable & alternative energy systems
- Fleet management & telematics

Software Infrastructure

- Developer Tools & APIs
- Kubernetes (K8s)
- DevOps Monitoring

Real-time Applications

- Gaming Applications
- FinTech Applications
- Network Monitoring

TIME SERIES DATA

Infrastructure & data sources

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Additional Data Sources: Computer/Device

Human Generated

➤ Account Updates
➤ Billing Updates
➤ Order Records

Transaction Oriented

Scales with business

Computer/Device Generated

➤ Log Events
➤ Device Status
➤ Sensor Status

Time Oriented

Scales with many factors

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Scalability

Interval	Number per second	Number of generated records per day
Minute	.0166666666	1,440
Second	1	86,400
Millisecond	1 thousand	86.4 Million
Microsecond	1 million	86.4 Billion
Nanosecond	1 billion	86.4 Trillion

1 Device - at various intervals

➔ Time Series databases are designed to be able to scale to a large volume of ingestion data

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Queryability & Query Performance

Time Series Databases are typically organized by time

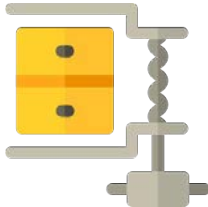Time Series Database are optimized for fast retrieval of blocks of time series data

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Summarization/Down Sampling

Weather Station Example

➔ Time Series Data can typically be summarized to reduce its size - often referred to as downsampling

➔ With Time Series, this can often happen at the database engine level without the need for a lot of additional coding

Today	Tomorrow
1 Sample Temperature Every 5 minutes	Yesterday's High & Low & Average Temperature
288 Records	1 Record

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Data Storage

Time Series Database Feature	Benefit
DownSampling/Summarization	Reduces Number of Records retained, reducing storage size
Compression	The nature of time series data typically makes it **very highly compressible**; this often gives time series databases a big advantage on needed storage size for the same amount of data
Data Retention Policies	Time Series Databases typically let you set a retention period for data and data that falls outside that retention period is automatically removed; based on the organization of data by time, this mass deletion of data doesn't have negative impact on your database like it can with some databases

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How do I know if Time Series is right for my application?

Does my data have a time element?

Do I care about changes in my data over time?

How much data will I be working with?

Will there be a need to do any analytics with my data in the future?

Am I concerned with Storage Costs?

Am I concerned about application performance with time series data?

Summary: There are Great Options Out There

RELATIONAL	DOCUMENT	SEARCH	**TIME SERIES**

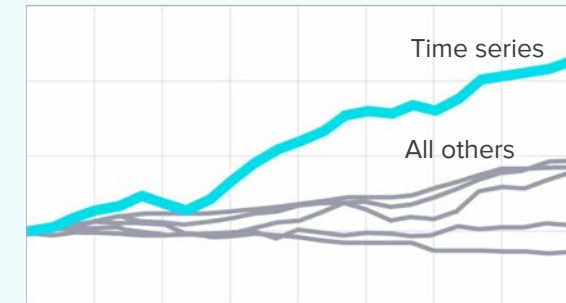| RELATIONAL	DOCUMENT	SEARCH	TIME SERIES
• Orders • Customers • Records	• High throughput • Large document	• Distributed search • Logs • Geo	• Events, metrics, time stamped • for IoT, analytics, cloud native

Time series is fastest growing data category by far

Time series

All others

source: DB Engines

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