

INFLUX DB

存儲指標和感知數據的最佳時間序列數據庫



課程資源連結

↖ [軟體安裝相關連結](#) (Telegraf / InfluxDB / Grafana)

↖ [本日課程共筆](#)

↖ [課程資料](#) <https://sites.google.com/bimap.co/zoe>

大數據解決方案

主力產品



Elasticsearch

當前企業中，最受歡迎的搜尋引擎，可以用於搜尋各種文件。它提供可延伸的搜尋，具有接近即時的搜尋效能，可用於半導體、銀行等各種領域。



InfluxData

高性能的監控以及告警的解決方案，為 TSDB 的領域中的佼佼者，以 Golang 為基礎開發，以時序型資料為主力，並廣泛用於監控、IoT 等場景。



Grafana Labs

跨平台、開源的視覺化資料處理平台，可以同時支援各種資料來源，包含 Splunk、Datadog、InfluxDB、Elasticsearch 等，因此被許多企業應用於整合性的場景。

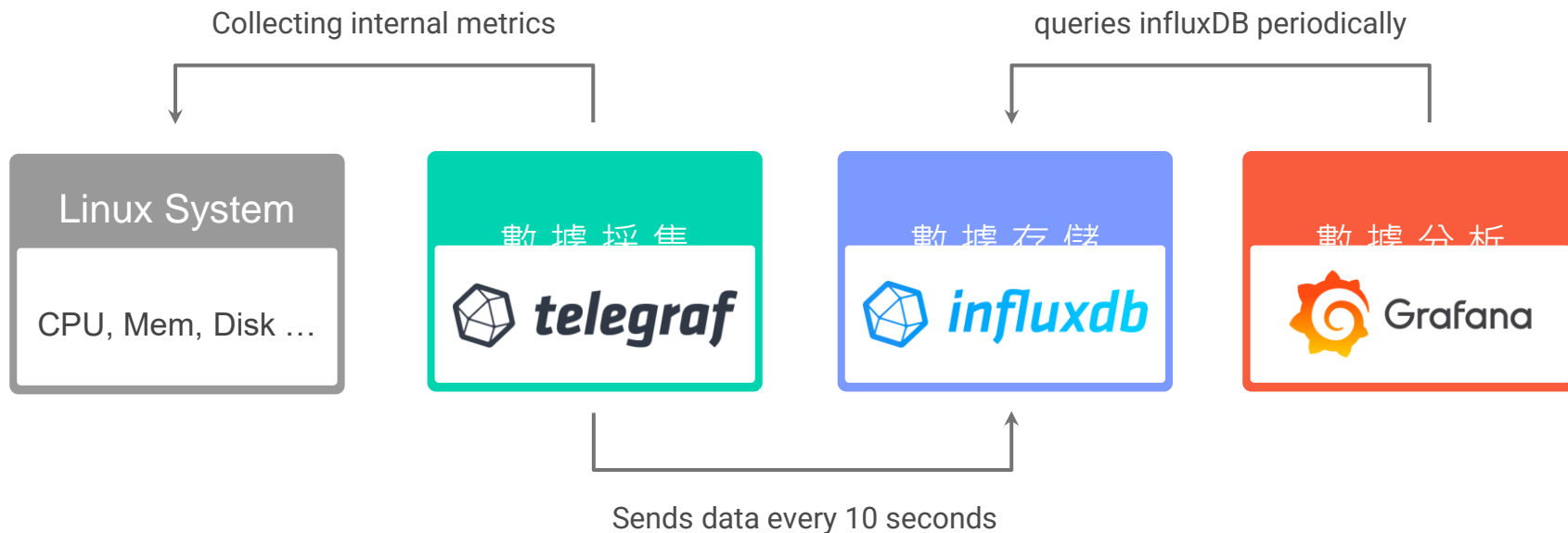
林宜欣 Zoe

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數據工程師 zoe.lin@bimap.co



數據流



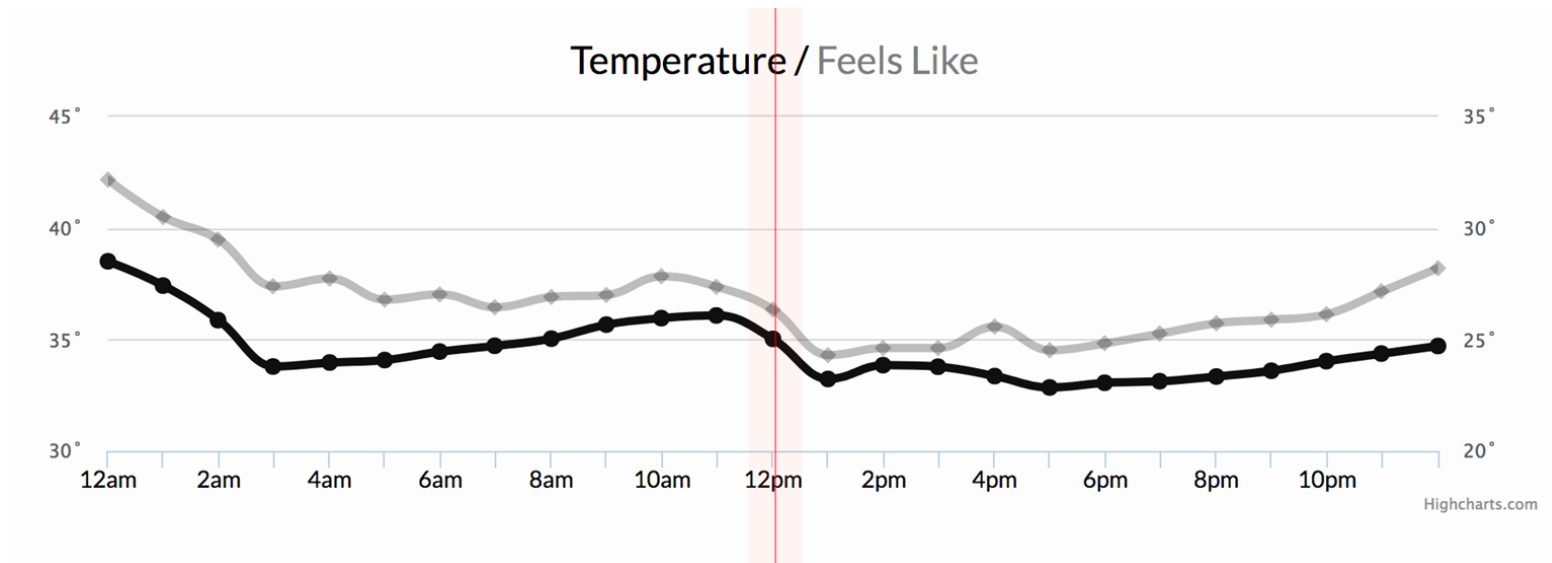
關聯式資料庫



什麼是時序型資料庫 Time Series Database

針對處理時間序列數據進行了優化，每一筆資料都會對應一個時間戳

時間序列數據可以由所謂的物聯網中的感測器、智慧電錶或RFID產生



Search Engine



elasticsearch

splunk[®]>



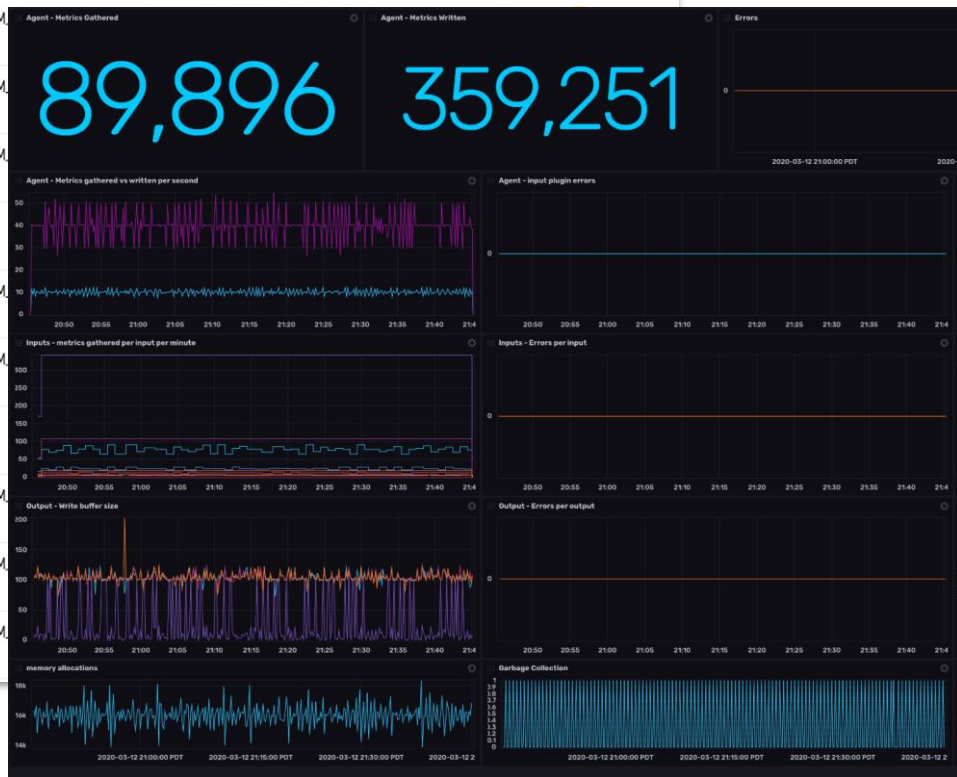
influxdb



redis

一般大數據資料與 TSDB 資料差別

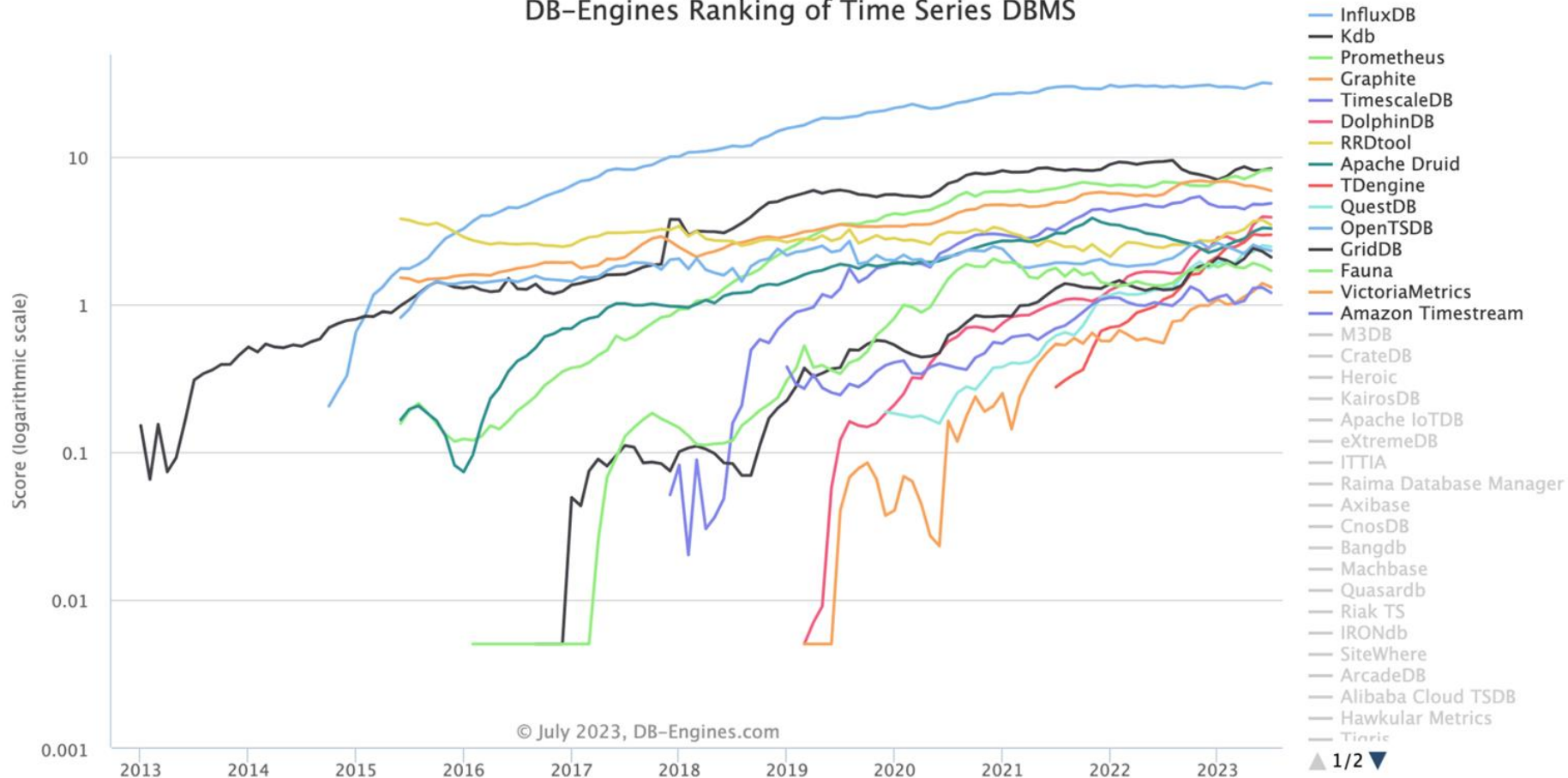
Time	location	fieldnum	class	id	errno	filenameLine	loglevel
▶ March 22nd 2016, 14:32:21.000	PIN_ERRLOC_FLIST:6	PIN_FLD_RESULTS:9,51	PIN_ERRCLASS_SYSTEM_ETERMINATE:1				
▶ March 22nd 2016, 14:32:21.000	PIN_ERRLOC_FLIST:6	PIN_FLD_RESULTS:9,51	PIN_ERRCLASS_SYSTEM_ETERMINATE:1				
▶ March 22nd 2016, 14:32:21.000	PIN_ERRLOC_FLIST:6	PIN_FLD_RESULTS:9,51	PIN_ERRCLASS_SYSTEM_ETERMINATE:1				
▶ March 22nd 2016, 14:32:21.000	Unknown pin location:0	0:0,0	UNKNOWN:0				
▶ March 22nd 2016, 14:32:21.000	PIN_ERRLOC_FLIST:6	PIN_FLD_RESULTS:9,51	PIN_ERRCLASS_SYSTEM_ETERMINATE:1				
▶ March 22nd 2016, 14:32:21.000	PIN_ERRLOC_FLIST:6	PIN_FLD_RESULTS:9,51	PIN_ERRCLASS_SYSTEM_ETERMINATE:1				
▶ March 22nd 2016, 14:32:21.000	Unknown pin location:0	0:0,0	UNKNOWN:0				
▶ March 22nd 2016, 14:47:30.000	PIN_ERRLOC_FLIST:6	PIN_FLD_RESULTS:9,51	PIN_ERRCLASS_SYSTEM_ETERMINATE:1				
▶ March 22nd 2016, 14:47:30.000	PIN_ERRLOC_FLIST:6	PIN_FLD_RESULTS:9,51	PIN_ERRCLASS_SYSTEM_ETERMINATE:1				
▶ March 22nd 2016, 14:47:30.000	PIN_ERRLOC_FLIST:6	PIN_FLD_RESULTS:9,51	PIN_ERRCLASS_SYSTEM_ETERMINATE:1				



資料庫引擎時間序列排名 DBMS

Rank			DBMS	Database Model	Score		
Jul 2023	Jun 2023	Jul 2022			Jul 2023	Jun 2023	Jul 2022
1.	1.	1.	InfluxDB	Time Series, Multi-model	30.92	-0.34	+1.70
2.	3.	2.	Kdb	Multi-model	8.22	+0.22	-0.95
3.	2.	3.	Prometheus	Time Series	8.05	+0.04	+1.37
4.	4.	4.	Graphite	Time Series	5.82	-0.22	+0.33
5.	5.	5.	TimescaleDB	Time Series, Multi-model	4.78	+0.08	+0.26
6.	6.	9.	DolphinDB	Time Series, Multi-model	3.85	-0.03	+2.22
7.	7.	7.	RRDtool	Time Series	3.42	-0.27	+1.02
8.	8.	6.	Apache Druid	Multi-model	3.23	-0.03	+0.37
9.	9.	13.	TDengine	Time Series, Multi-model	2.93	+0.02	+1.86
10.	10.	11.	QuestDB	Time Series, Multi-model	2.43	-0.05	+1.16

DB-Engines Ranking of Time Series DBMS



InfluxDB 的特點

C R U D

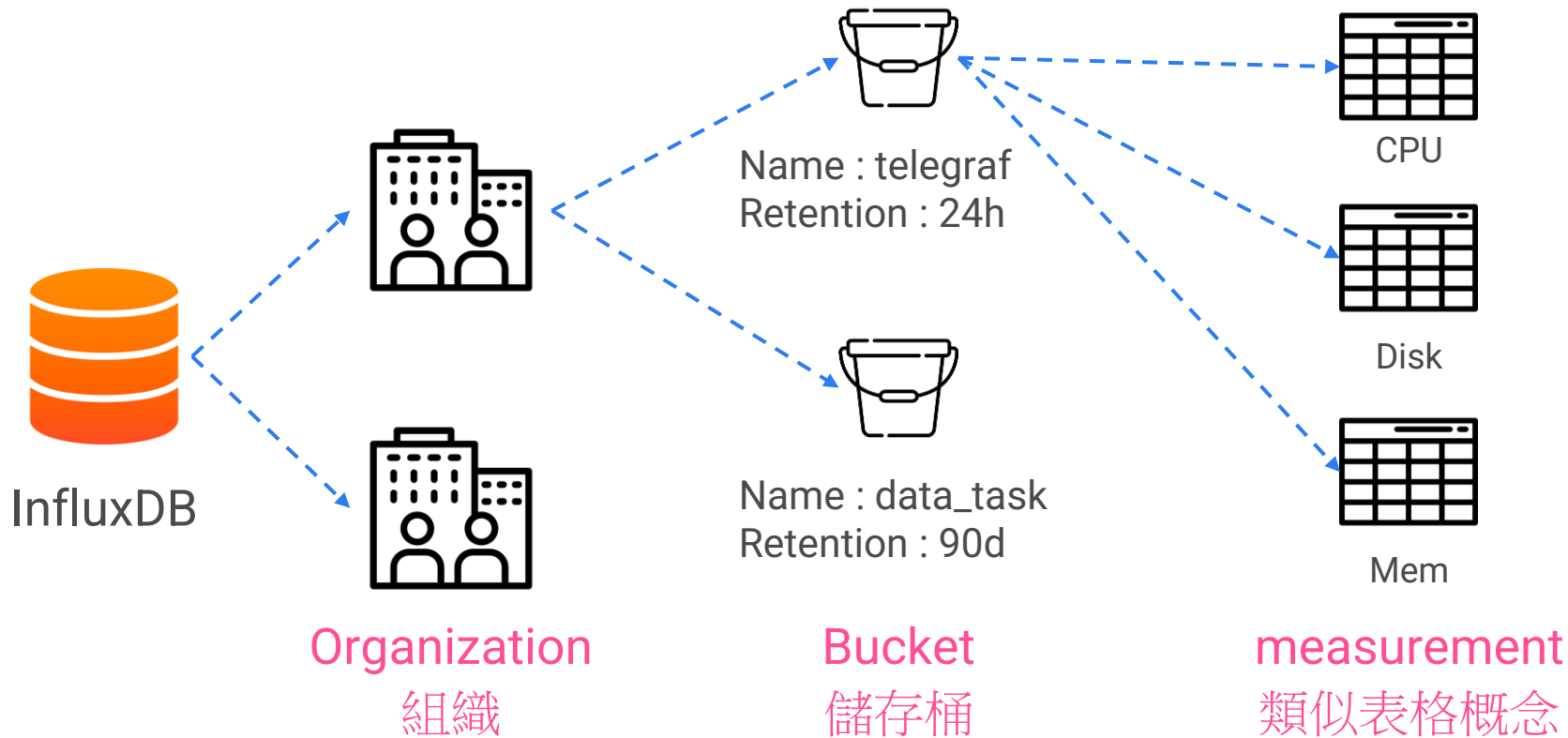
Write :

1. 高併發高吞吐，可持續的數據寫入。
2. 寫多讀少，時序數據95%以上都是寫操作。
3. 不支持數據更新，但是可以修改覆蓋數據，批量刪除。

Read :

1. 數據查詢首要是按照時間段讀取，給出具體時間範圍。
2. 越接近的數據讀取效率高，越舊的數據則越低。
3. 大量的資料處理統計函式可使用，提供多種維度分析。

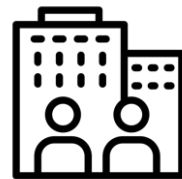
InfluxDB v2 基本架構



基本架構說明

Organization

簡稱 Org (組織) 是獨立的工作空間，可以加入多個 user 與同一個 org 中，所有 dashboard (儀表板)、task (任務)、bucket (存儲桶)，在 org 間彼此不會共享。



Bucket

存儲桶是存儲時間序列數據的命名位置。所有存儲桶都有一個 Retention 保留期，即每個數據點持續存在的時間。InfluxDB 會刪除時間戳早於存儲桶保留期的所有點。存儲桶屬於一個組織。



數據格式 Line protocol



disk,host=bimap,name=sda used=80.53 1690088317

與傳統數據庫中的名詞做比較

influxDB 元素	傳統數據庫中的概念
bucket	database
measurement	table
points	rawdata

Classic Relational Databases

Name ▲	Age ⇅	Nickname	Employee ▼
Giacomo Guilizzoni Founder & CEO	40	Peldi	<input type="radio"/>
Marco Botton Tuttofare	38		<input checked="" type="checkbox"/>
Mariah Maclachlan Better Half	41	Patata	<input type="checkbox"/>
Valerie Liberty Head Chef	46	Val	<input checked="" type="checkbox"/>

Data are multidimensional

Time Series Databases

Sensor Temperature ▲	Time	
39.5	12/04/19 @ 14:12	
41.2	12/04/19 @ 14:13	
12.4	14/04/19 @ 12:15	
18.5	16/04/19 @ 10:05	

Data are aggregated over time



常用 Flux 語法

[↩ All](#)

Transformations

group / map / join / set / sort / top

Schema changing

drop / keep / duplicate / rename

Aggregate

count / mean / sum /

derivative

Selector

first / last / max / min

Type Conversions

toFloat / toInt / toString

Write

to(bucket:

"your bucket name")

Flux 變數設定語法

buckets

schema 開頭需加上 : **Import influxdata/influxdb/v1**

schema.fieldKeys

schema.fieldsAsCols schema.measurementFieldKeys

schema.measurements schema.measurementTagKeys

schema.measurementTagValues schema.tagKeys

schema.tagValues

Flux 查詢格式

```
memory,host=bimap used=92.43 1690122551000000000
```

```
from(bucket: "sample")  
  
    // 指定數據源檢索數據  
  
|> range(start: -1m)  
  
    // 指定時間範圍檢索數據  
  
|> filter(fn: (r) => r["_measurement"] == "memory")           // 指定表名稱檢索數據  
  
|> filter(fn: (r) => r["_field"] == "used")                   // 根據列值篩選數  
據  
  
|> filter fn: (r) => r["host"] == "bimap")                     // 根據 tag 值篩選
```

Flux 查詢運作過程

```
from(bucket: "sample")
|> range(start: -1h)
|> filter(fn: (r) => r["_measurement"] == "disk")
|> filter(fn: (r) => r["_field"] == "used")
|> filter(fn: (r) => r["host"] == "bimap")
|> map(fn: (r) =>
({ r with _value: int(v:r._value) * 1024 }))
|> aggregateWindow(every: v.windowPeriod, fn: mean)
|> yield(name: "mean")
```

Pushed to the data

Run in memory

InfluxDB UI 介面

The screenshot shows the InfluxDB Data Explorer interface. The main area displays a line graph with a prominent spike. The interface is annotated with several red boxes and Chinese labels:

- Chart 樣式**: A red box highlights the left sidebar menu containing options like Graph, Gauge, Graph + Single Stat, and Heatmap.
- 切換文字顯示**: A red box highlights the 'View Raw Data' toggle switch.
- 調整時間範圍**: A red box highlights the time range selector, currently set to '2023-07-21 16:33 to 2023-07-22 00:00'.
- 編輯語法**: A red box highlights the 'SCRIPT EDITOR' button.
- 資料選取**: A red box highlights the filter configuration area, showing selected filters for 'cpu', 'bimap-A', and 'total'.
- 變數調整**: A red box highlights the 'WINDOW PERIOD' settings, showing 'CUSTOM' and 'AUTO' options.

Other visible elements include the 'Data Explorer' title, a 'Switch to old Data Explorer' toggle, a 'CUSTOMIZE' button, a 'Local' dropdown, and a 'SAVE AS' button.

建立 InfluxDB Bucket

Load Data

SOURCES BUCKETS TELEGRAF SCRAPERS API TOKENS

Filter buckets...

data

Retention: Forever ID: 8f0fb0de4a7belf

+ Add a label

ipoc_sysload_176

Retention: 90 days ID: c7f7c4b67323f99d

+ Add a label

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上傳數據到 InfluxDB

The screenshot displays the 'Load Data' section of the InfluxDB web interface. At the top, there are navigation tabs for SOURCES, BUCKETS, TELEGRAF, SCRAPERS, and API TOKENS. Below these is a search bar labeled 'Filter buckets...' and a dropdown menu set to 'Sort by Name (A → Z)'. Two buckets are listed: 'oss_metrics' (Retention: 30 days, ID: b71dd96a14b297d7) and 'test' (Retention: Forever, ID: ce6c7aeb884ff3bc). Each bucket has an 'Add a label' button and an 'ADD DATA' button. A modal window is open on the right, titled 'Configure Telegraf Agent', which lists four data loading methods: 'Line Protocol' (highlighted with a red box), 'CSV Upload', 'Client Library', and 'Scrape Metrics'. The 'Line Protocol' option is described as 'Quickly load an existing line protocol file.' The 'ADD DATA' button for the 'test' bucket is also highlighted with a red box.

Load Data

SOURCES BUCKETS TELEGRAF SCRAPERS API TOKENS

Filter buckets... Sort by Name (A → Z)

oss_metrics
Retention: 30 days ID: b71dd96a14b297d7
+ Add a label + ADD DATA

test
Retention: Forever ID: ce6c7aeb884ff3bc
+ Add a label + ADD DATA

Configure Telegraf Agent
Configure a Telegraf agent to push data into your bucket.

- Line Protocol**
Quickly load an existing line protocol file.
- CSV Upload**
Quickly load an existing csv file.
- Client Library**
Write data easily from your own application.
- Scrape Metrics**
Add a scrape target to pull data into your bucket.

Line Protocol



BUCKET

+ CREATE BUCKET

data

ipoc_sysload_176

oss_metrics

test

UPLOAD FILE

ENTER MANUALLY

Precision: Nanoseconds



data.txt



WRITE DATA

CANCEL

Variables 變數設定 bucket

Create Variable ✕

Name* ✓

Type* Query ▾

Script

```
1  
2  
3 buckets()  
4 |> filter(fn: (r) => r.name !~ /^_/)  
5 |> rename(columns: {name: "_value"})  
   |> keep(columns: ["_value"])
```


Variables 變數設定 host

Edit Variable



Name

host

Type*

Query

*To rename your variable, click the gear at the top right of the variable in the previous page and click rename.

Script

```
1
2 import "influxdata/influxdb/v1"
3
4 v1.tagValues(
5   bucket: v.bucket,
6   tag: "host",
7   predicate: (r) => true,)
8
```

Name this Cell

Graph

CUSTOMIZE

Local

x

✓

No Results

Query 1 (0.00s)

+

View Raw Data

↻

Past 1h

QUERY BUILDER

SUBMIT

```
1 from(bucket: v.bucket)
2   |> range(start: v.timeRangeStart, stop: v.timeRangeStop)
3   |> filter(fn: (r) => r["_measurement"] == "cpu")
4   |> filter(fn: (r) => r["_field"] == "system_usage" or r["_field"] == "user_usage")
5   |> filter(fn: (r) => r["cpu_name"] == "total")
6   |> filter(fn: (r) => r["host"] == v.host)
7   |> aggregateWindow(every: v.windowPeriod, fn: mean, createEmpty: false)
8   |> yield(name: "mean")
```

Filter Variables...

bucket

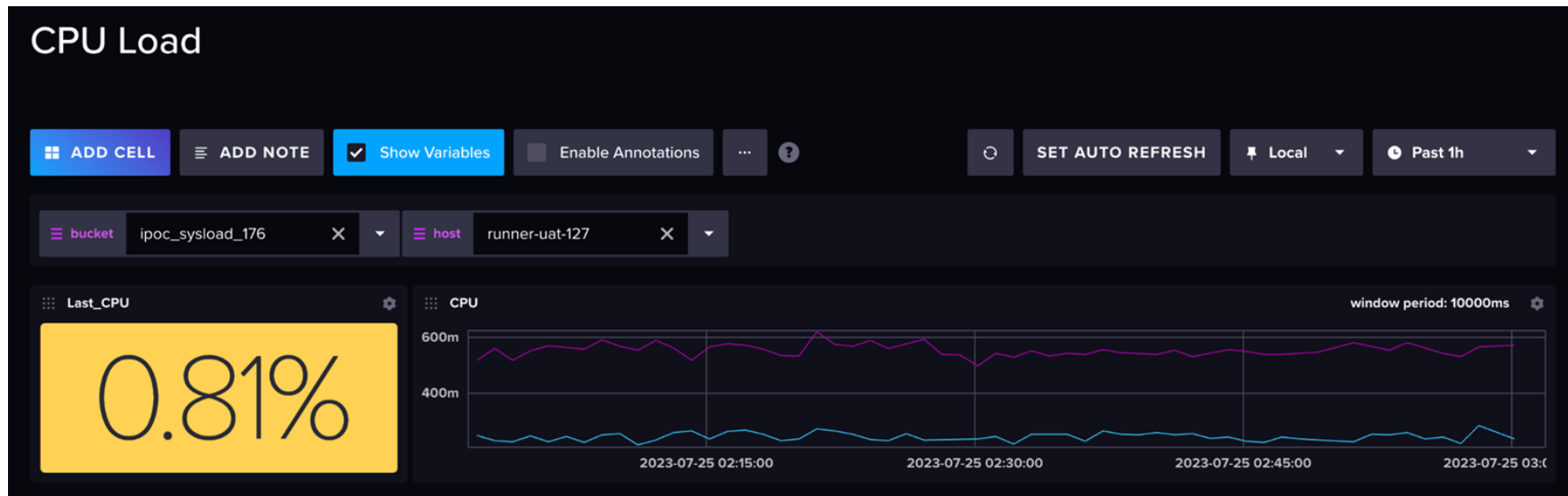
host

timeRangeStart

Functions

Variables

Variables 變數設定



Task

常用於對數據進行縮減採樣，以減少隨時間收集數據時的總體磁碟使用量。

Edit Task

Name
memory_minMax

Schedule Task
EVERY CRON

Every **Offset**
1d -8h

```
1 option task = {name: "memory_minMax", every: 1d, offset: -8h}
2
3 taskBucket = "sample"
4
5 data =
6   from(bucket: "ipoc_sysload_176")
7     |> range(start: -1d)
8     |> filter(fn: (r) => r["_measurement"] == "memory")
9     |> filter(fn: (r) => r["_field"] == "mem_usage")
10    |> filter(fn: (r) => r["host"] == "ifdbpro-176")
11
12 data
13   |> max()
14   |> set(key: "_field", value: "mem_max")
15   |> to(bucket: taskBucket)
16
17 data
18   |> min()
19   |> set(key: "_field", value: "mem_min")
20   |> to(bucket: taskBucket)
21
```

```
option task = {name: "memory_minMax", every: 1d, offset: -8h}
```

```
taskBucket = "sample"
```

```
data =
```

```
from(bucket: "ipoc_sysload_176")
```

```
|> range(start: -1d)
```

```
|> filter(fn: (r) => r["_measurement"] == "memory")
```

```
|> filter(fn: (r) => r["_field"] == "mem_usage")
```

```
|> filter(fn: (r) => r["host"] == "ifdbpro-176")
```

```
data
```

```
|> max()
```

```
|> set(key: "_field", value: "mem_max")
```

```
|> to(bucket: taskBucket)
```

```
data
```

```
|> min()
```

```
|> set(key: "_field", value: "mem_min")
```

```
|> to(bucket: taskBucket)
```