

# Multi-Dimensional, In-GPU-Memory Databases: Streaming Conditional Calculations in Big Data Sets

Peter Strohm | GTC15 | San José | 03/17/2015

**2002**

Founded in Freiburg, Germany

**Today**

Offices in Freiburg, Frankfurt,  
Düsseldorf, Paris, Boston

**120**

Global Business Partners

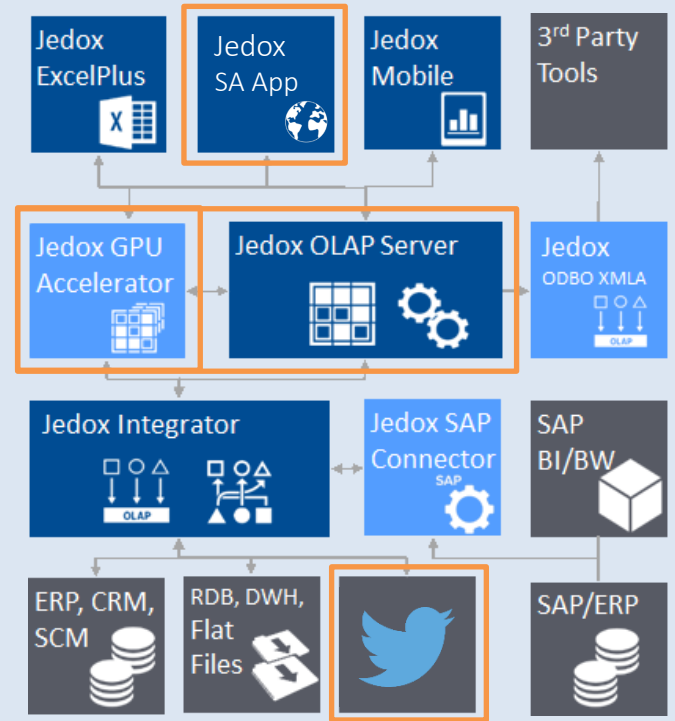


**125**

Countries with Jedox Users

**25**

Language Versions



# Big Data in real-time: Twitter



500.000.000

tweets per day



6.000.000

localized tweets per day



60.000.000

data points per day



> 4.000

tweets per minute



12 GB

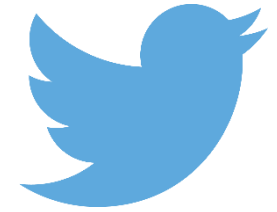
data volume per GPU



< 1 second

of computation time

# Big Data in real-time: Twitter



**Peter @ Jedox**

@PSJedox

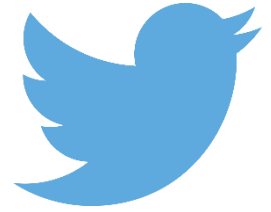
Join the Jedox Session #S5481 about Big  
Data Analytics on GPU In-Memory  
databases at #gtc15 on Tuesday at 13:30!

📍 California, USA



23:36 - 16. März 2015

# Twitter: Big Data in Real-time



 Peter @ Jedox  
@PSJedox

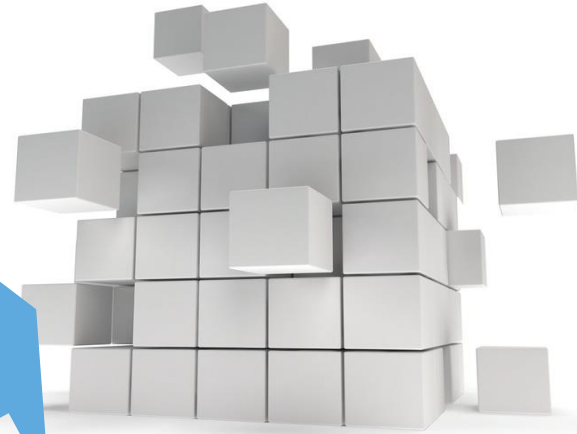
Join the Jedox Session #S5481 about Big  
Data Analytics on GPU in-Memory  
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California, USA

23:36 - 16. März 2015



Dictionary	Date	Hour	Minute	Second	Longitude	Latitude	Language	TweetID
Join	2015-03-16	23	36	49	-121	37	en	577599223119548416
Jedox	2015-03-16	23	36	49	-121	37	en	577599223119548416
Session	2015-03-16	23	36	49	-121	37	en	577599223119548416
#S5481	2015-03-16	23	36	49	-121	37	en	577599223119548416
...								

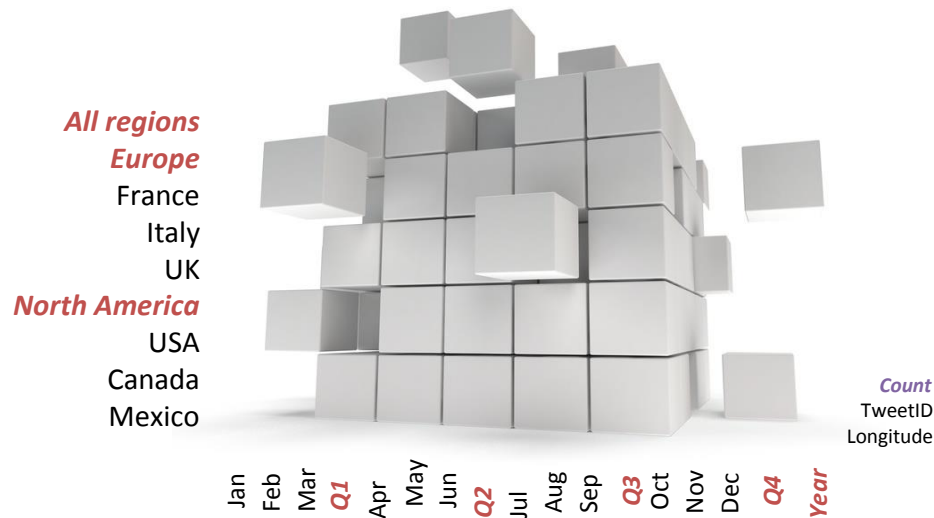
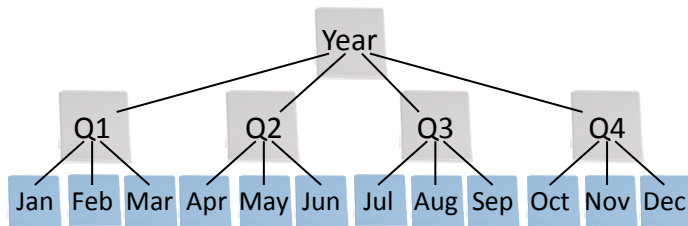


**jedox.**

# In-GPU-Memory OLAP-Database

1 All data in GPU memory

2 Hierarchical structure of consolidated elements

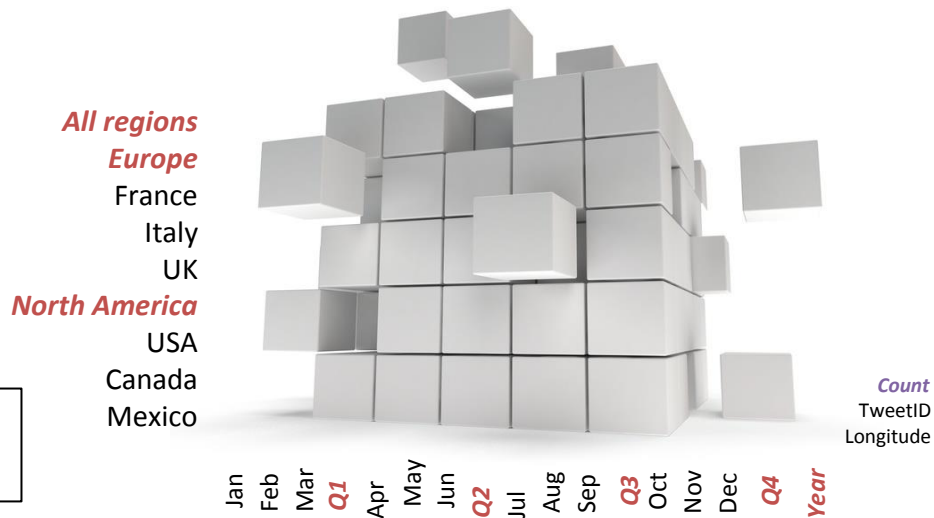


# In-GPU-Memory OLAP-Database

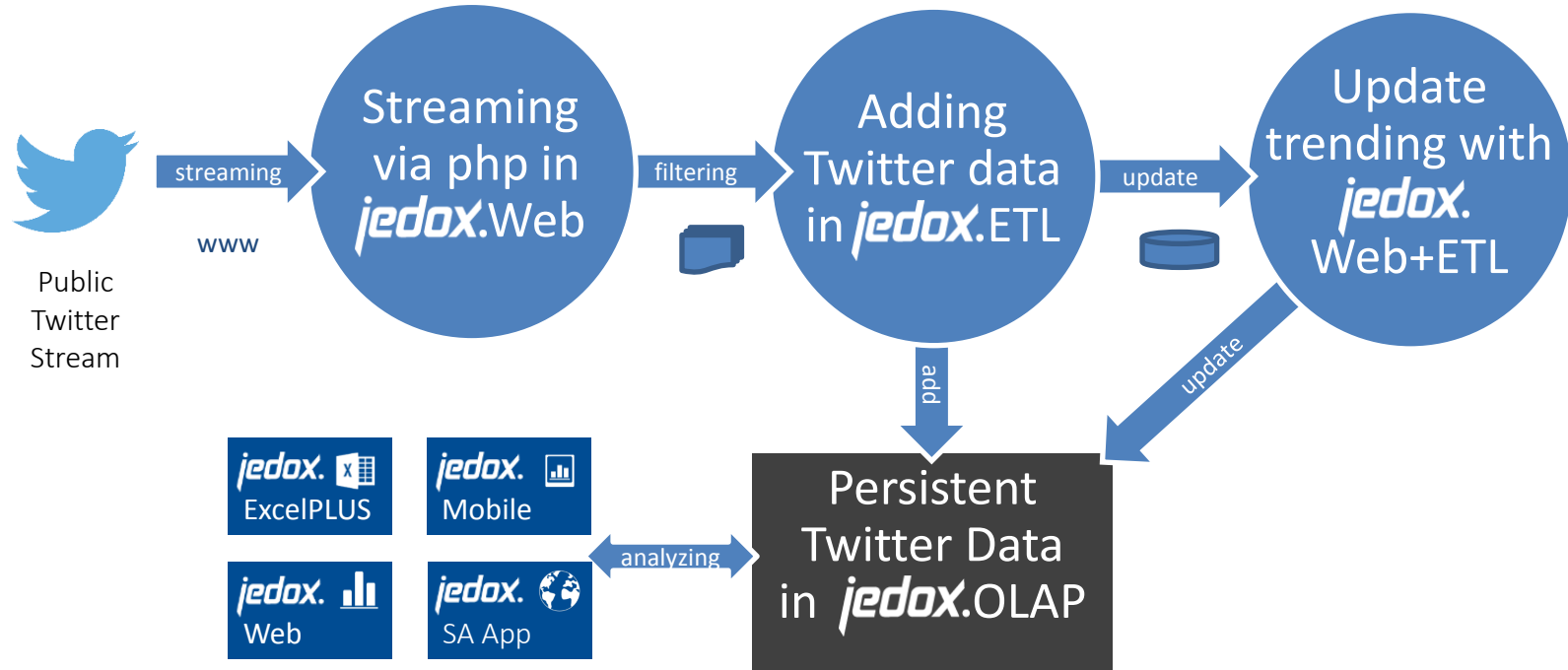
3 Calculation “on-the-fly”

4 Store only non-zero values

i In-GPU-Memory & “on-the-fly”



# Jedox Social Analytics Workflow





# Jedox Social Analytics with GPU

1

System: 2 x K40 with 12 GB GPURAM  
CPU with 128GB RAM

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2

Data sets with > 500 million entries

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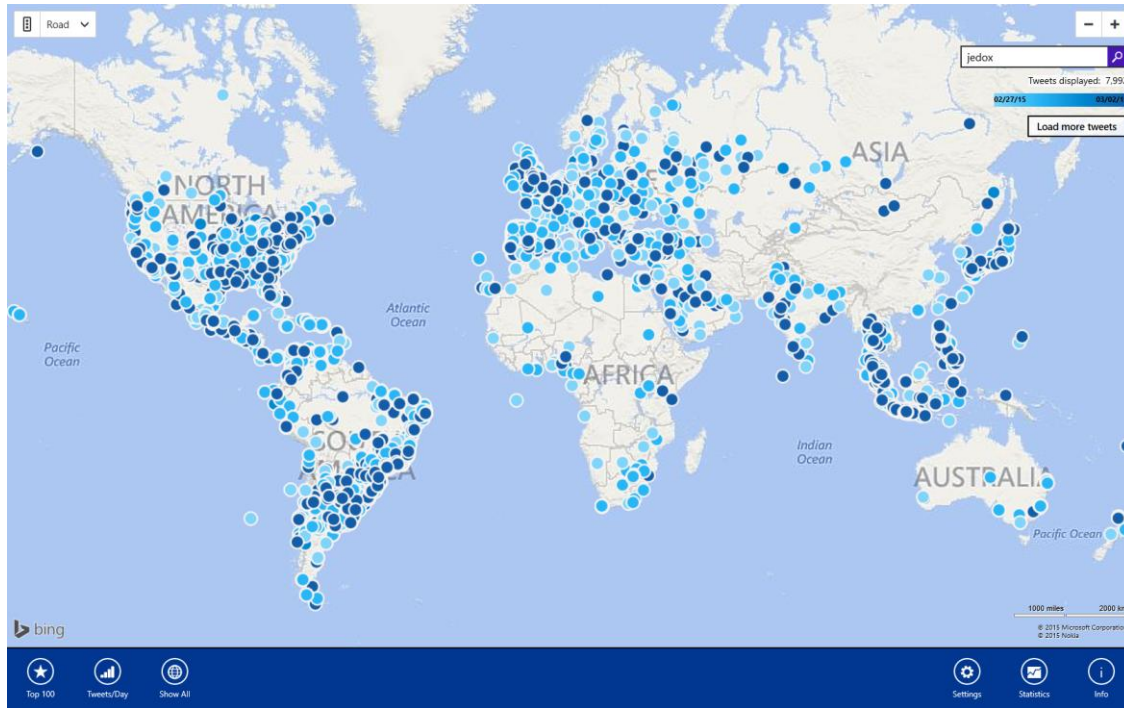


3

Calculating “on-the-fly” on *all* data entries



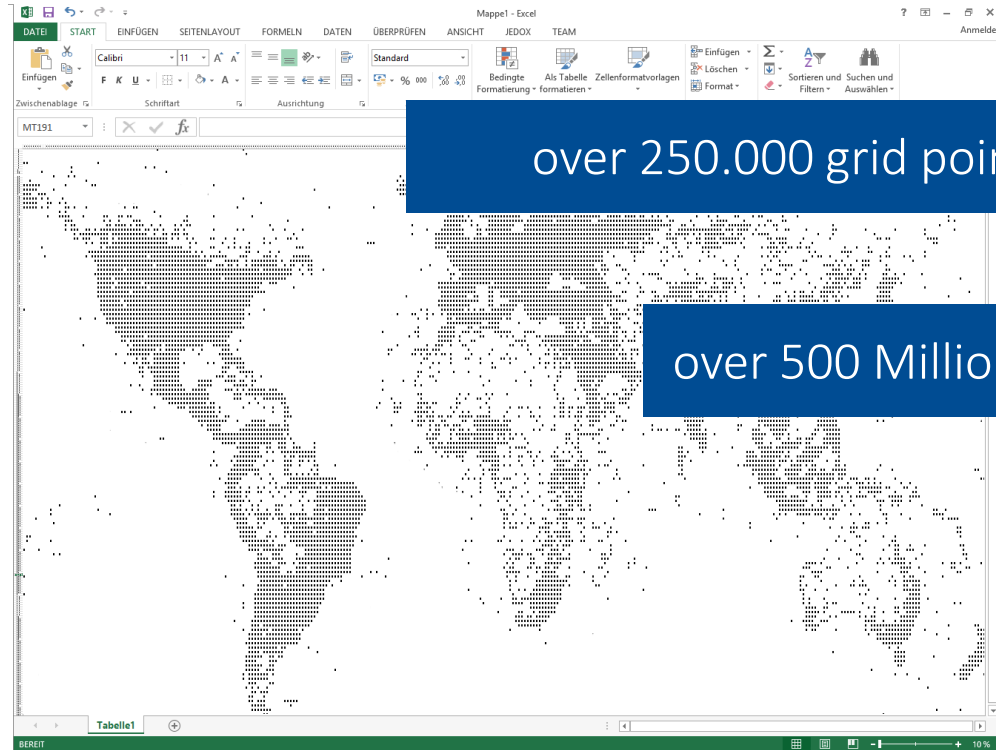
# Jedox Social Analytics Showcase



# Jedox Social Analytics Showcase



# Social Media Analytics: HeatMap

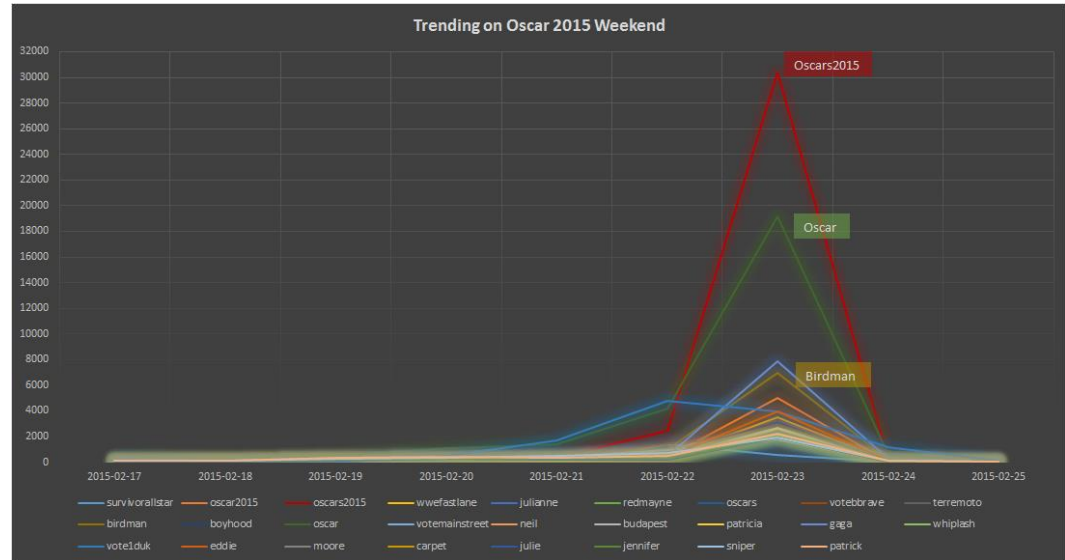


# Social Media Analytics: Trending

## 1 Top 100 Trending Factor

$$\frac{\# \text{ current day}}{\# \text{ all previous days}}$$

2 ~ 28.000 dictionary words  
> 80 Million DB entries



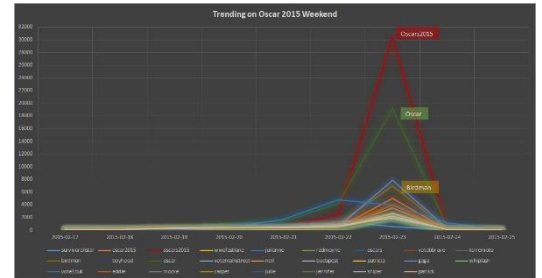
# Social Media Analytics: Trending

1 Assigning *Trending Factor* to **virtual cells** (e.g.  $[TF] = [B] / [C]$ )

2 *Trending Factor* is **calculated** on the fly

3 Conditional Calculation: IF-Rule

```
IF      ([count] >1000)
THEN   [count,currentDay] / [count,previousWeek]
ELSE   0
```



# Conditional Rule with constants

[TF] = IF

([B] > 1000)

THEN [C]

ELSE 0

Rule  
Processor

>  
Processor

Matching  
Processor

Constant  
(0)

Matching  
Processor

Constant  
(1000)

# Conditional Rule with constants

[TF] = IF

([B] > 1000)

THEN [C]

ELSE 0

Rule  
Processor

>  
1  
1  
0  
1  
0  
...  
...

Matching  
Processor

Constant  
(0)



# Conditional Rule with constants

[TF] = IF

([B] > 1000)

THEN [C]

ELSE 0

Rule  
Processor

>  
1  
1  
0  
1  
0  
...  
...

T  
A,1  
A,2  
A,3  
A,4  
A,5  
...  
...

Constant  
(0)

# Conditional Rules with constants

[TF] = IF

([B] > 1000)

THEN [C]

ELSE 0

Rule  
Processor

>  
1  
1  
0  
1  
0  
...  
...

T  
A,1  
A,2  
A,3  
A,4  
A,5  
...  
...

T

# Conditional Rules on GPU

[TF] = IF

([B] > 1000)

THEN [C]

ELSE 0

Rule Processor

TRUE

FALSE

>
1
1
0
1
0
...
...

T
A,1
A,2
A,3
A,6
A,8
...
...

T
---

# Conditional Rules on GPU

[TF] = IF

([B] > 1000)

THEN [C]

ELSE 0

Rule Processor

TRUE

FALSE

>  
1  
1  
0  
1  
0  
...  
...

T  
A,1  
A,2  
A,3  
A,6  
A,8  
...  
...

T

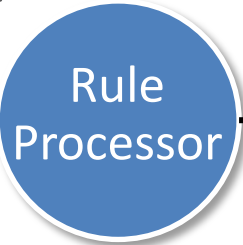
# Conditional Rules on GPU

[TF] = IF

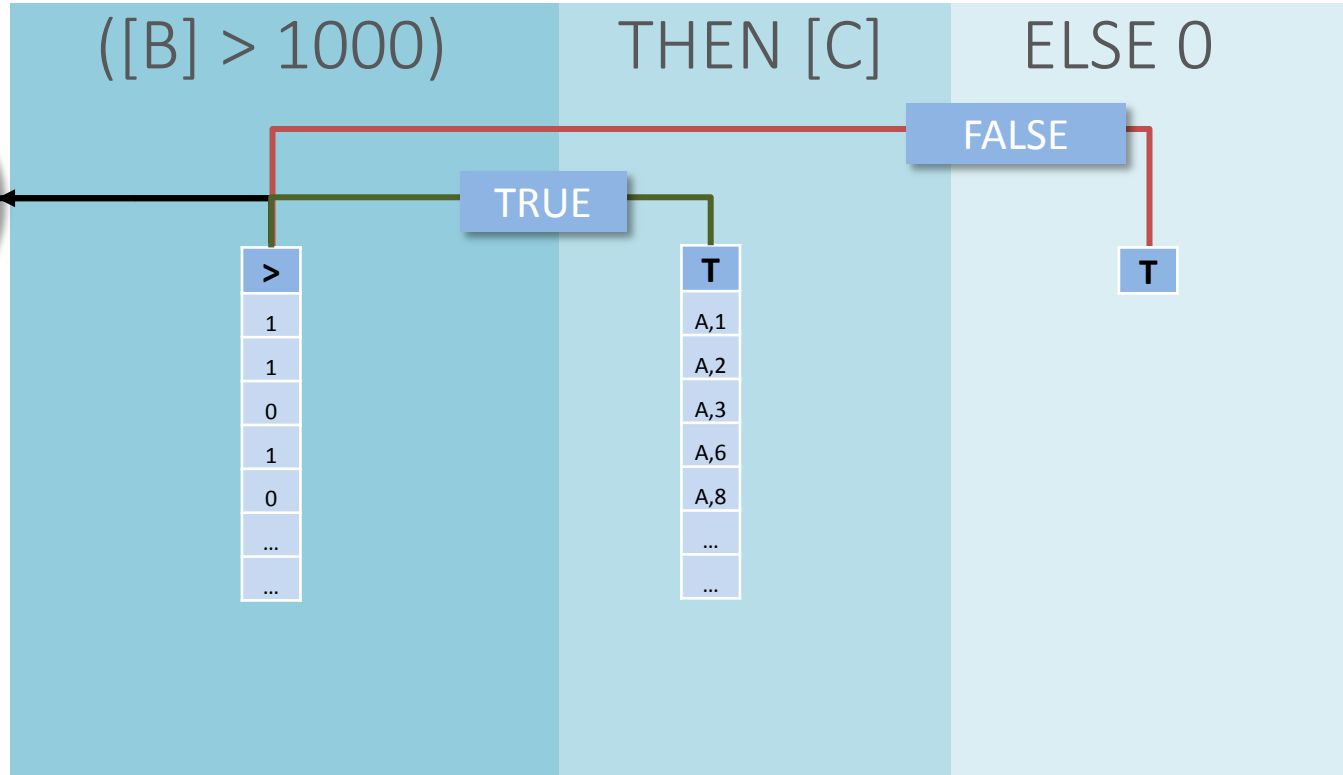
([B] > 1000)

THEN [C]

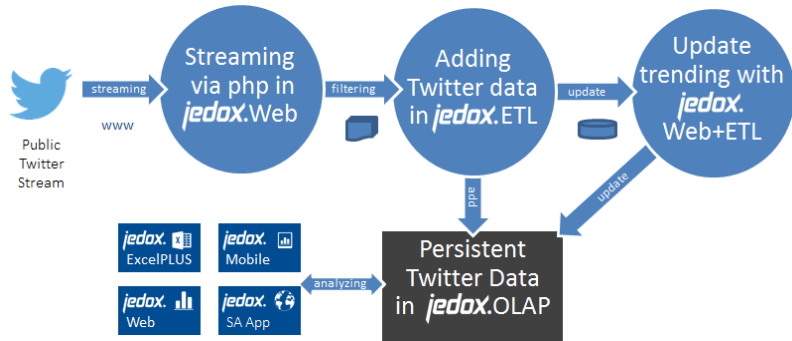
ELSE 0



complete set



# Conditional Rules on GPU



## GPU MEMORY



SPACE FOR CALCULATIONS

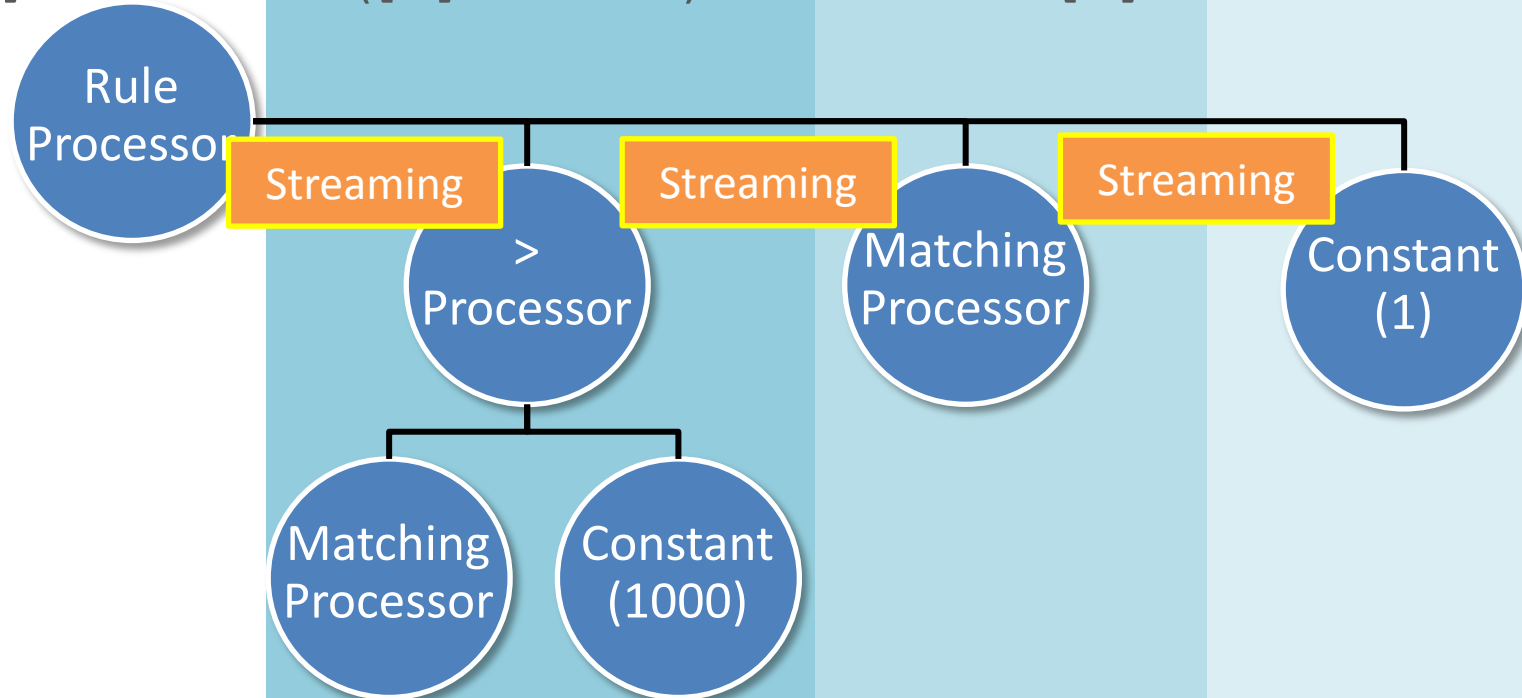
# Conditional Rule on GPU

[TF] = IF

([B] > 1000)

THEN [C]

ELSE 1



# Streaming in Conditional Rules

[TF] = IF

([B] > 1000)

THEN [C]

ELSE [D]

Rule Processor

> Processor

Part 1

Part 2

Matching Processor  
Total

Part 1

Matching Processor

Part 2

Constant (1000)



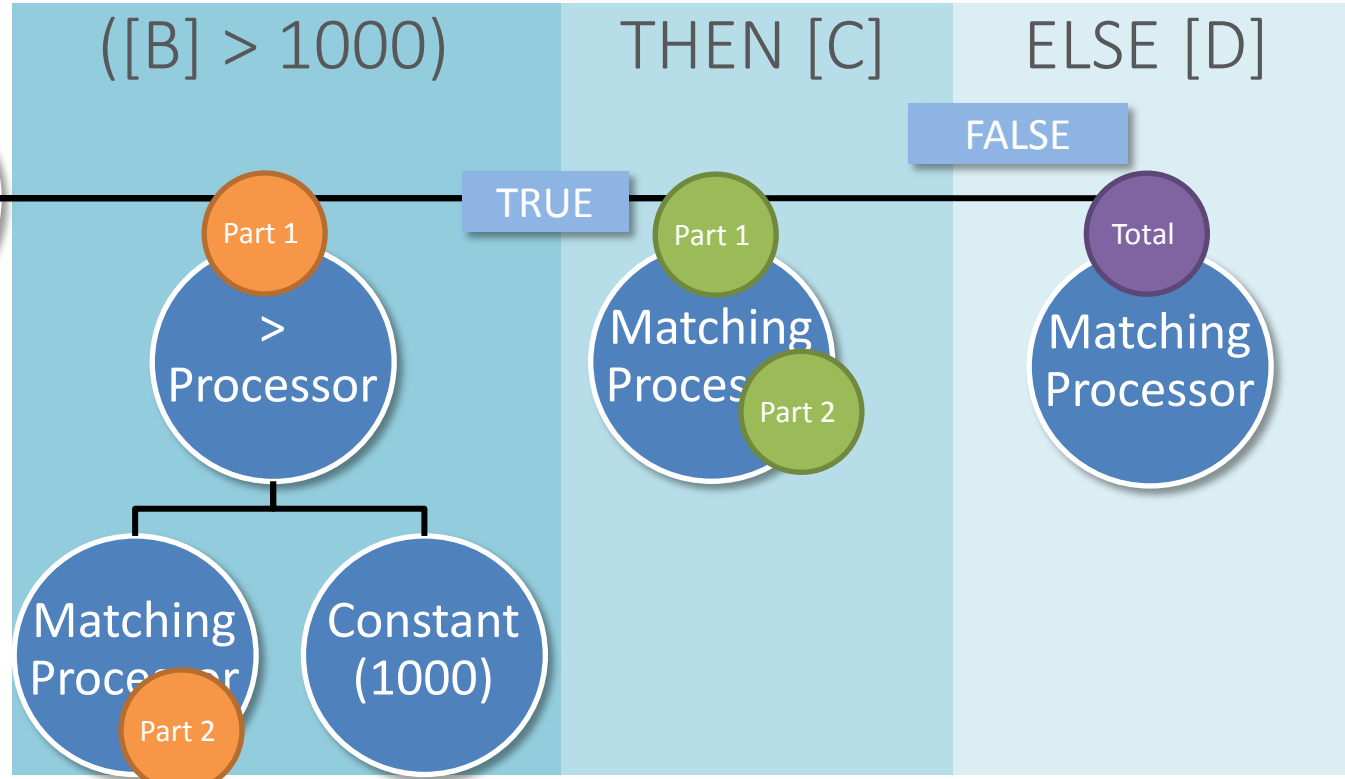
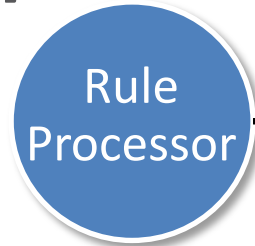
# Streaming in Conditional Rules

[TF] = IF

([B] > 1000)

THEN [C]

ELSE [D]



# Streaming in Conditional Rules

[TF] = IF

([B] > 1000)

THEN [C]

ELSE [D]

Rule Processor

> Processor

Matching Processor

Matching Processor

Part 1

Sub-Total

Part 2

Matching Processor

Constant (1000)

Part 2

# Streaming in Conditional Rules

[TF] = IF

([B] > 1000)

THEN [C]

ELSE [D]

Rule Processor

1

>  
Processor

Matching  
Process

Part 2

Matching  
Processor

Matching  
Processor

Part 2

Constant  
(1000)

# Streaming in Conditional Rules

[TF] = IF

([B] > 1000)

THEN [C]

ELSE [D]

Rule Processor

1

>  
Processor

Matching  
Process

Part 2

Matching  
Pr  
Total or

Matching  
Processor

Part 2

Constant  
(1000)

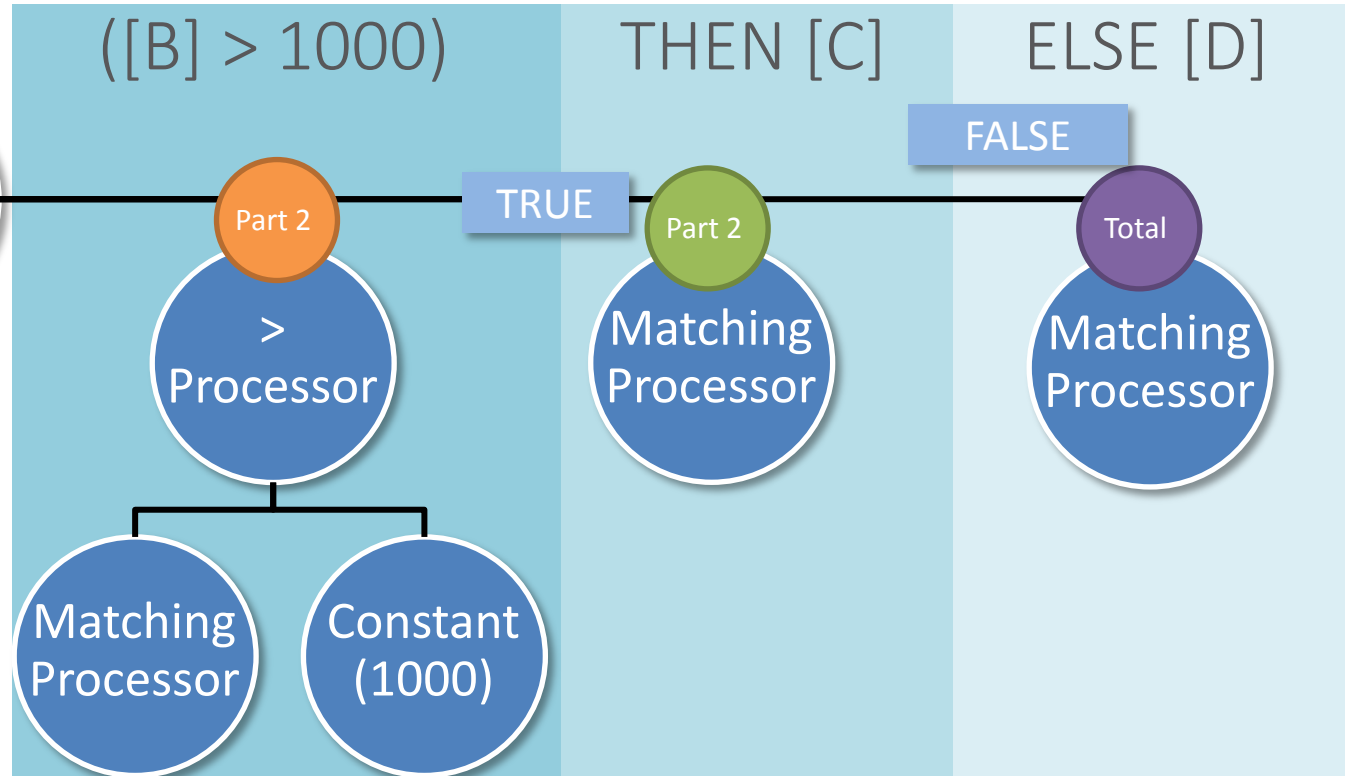
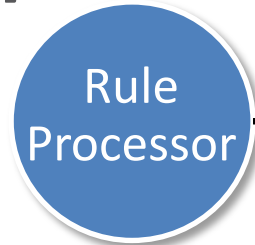
# Streaming in Conditional Rules

[TF] = IF

([B] > 1000)

THEN [C]

ELSE [D]



# Streaming in Conditional Rules

[TF] = IF

([B] > 1000)

THEN [C]

ELSE [D]

Rule Processor

>  
Processor

Matching Processor

Matching Processor

1

Part 2

Sub-Total

Matching Processor

Constant (1000)

# Streaming in Conditional Rules

[TF] = IF

([B] > 1000)

THEN [C]

ELSE [D]

Rule Processor

>  
Processor

Matching Processor

Matching Processor

1

2

Matching Processor

Constant (1000)

# Streaming in Conditional Rules

[TF] = IF

([B] > 1000)

THEN [C]

ELSE [D]

Rule Processor

complete result set

>  
Processor

Matching Processor

Matching Processor

Matching Processor

Constant (1000)

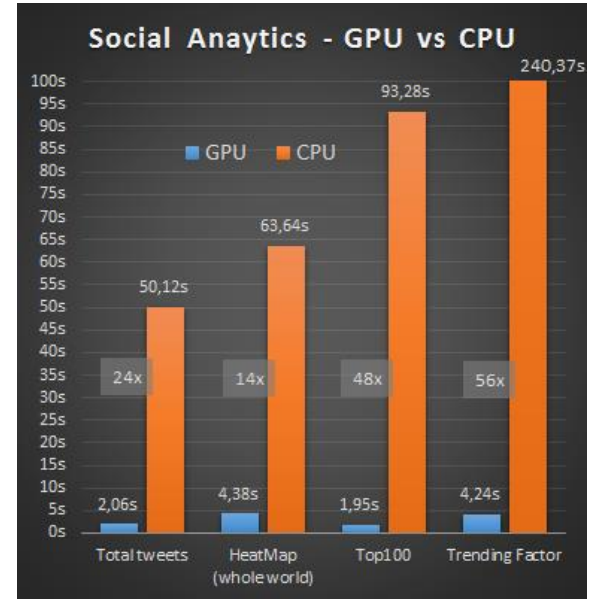


# Features: Performance with GPU

- 1 Top 100
- 2 Heat Map
- 3 Trending Factor

! Speed-up up to 50x and more!

! In-GPU-Memory database & calculations



# Jedox Social Analytics Showcase

Jedox Social Analytics App download at:  
[www.jedox.com/en/jedox-social-analytics](http://www.jedox.com/en/jedox-social-analytics)

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Steffen Wittmer

Leo Mehlig



