

Analyzing a Soccer Game with WSO2 CEP

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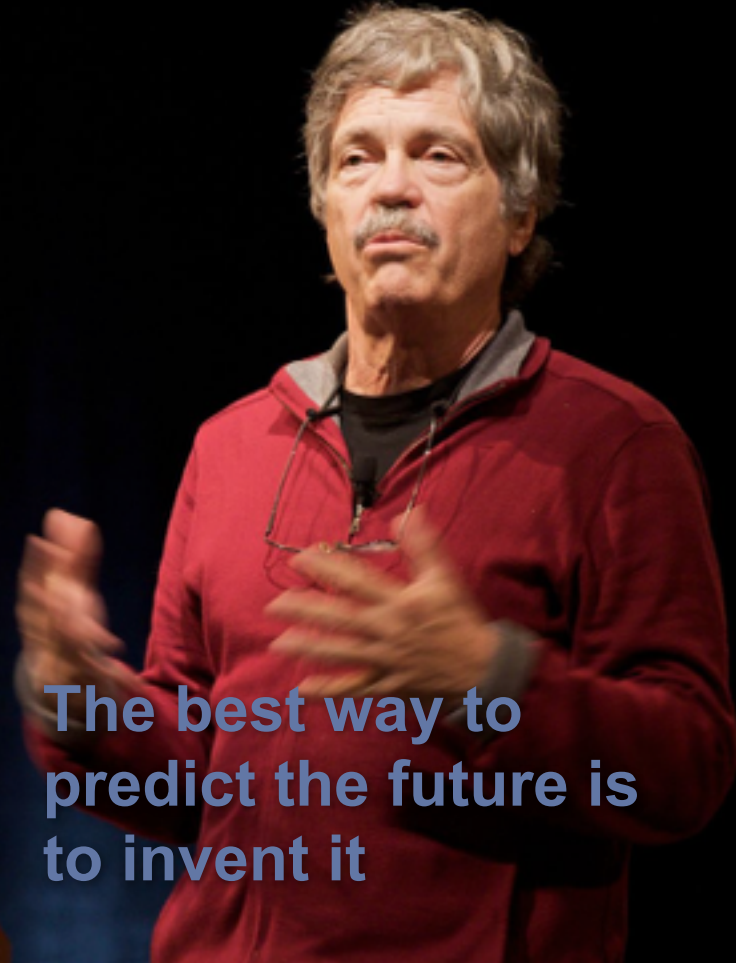
Vision of the Future

- Sensors everywhere
- Data collected from everywhere, analyzing, optimizing, and helping (and hopefully not taking over)
- Analytics and Internet of things .. Immersive world
- Big data and real-time analytics will be crucial. How far are we from realizing that?



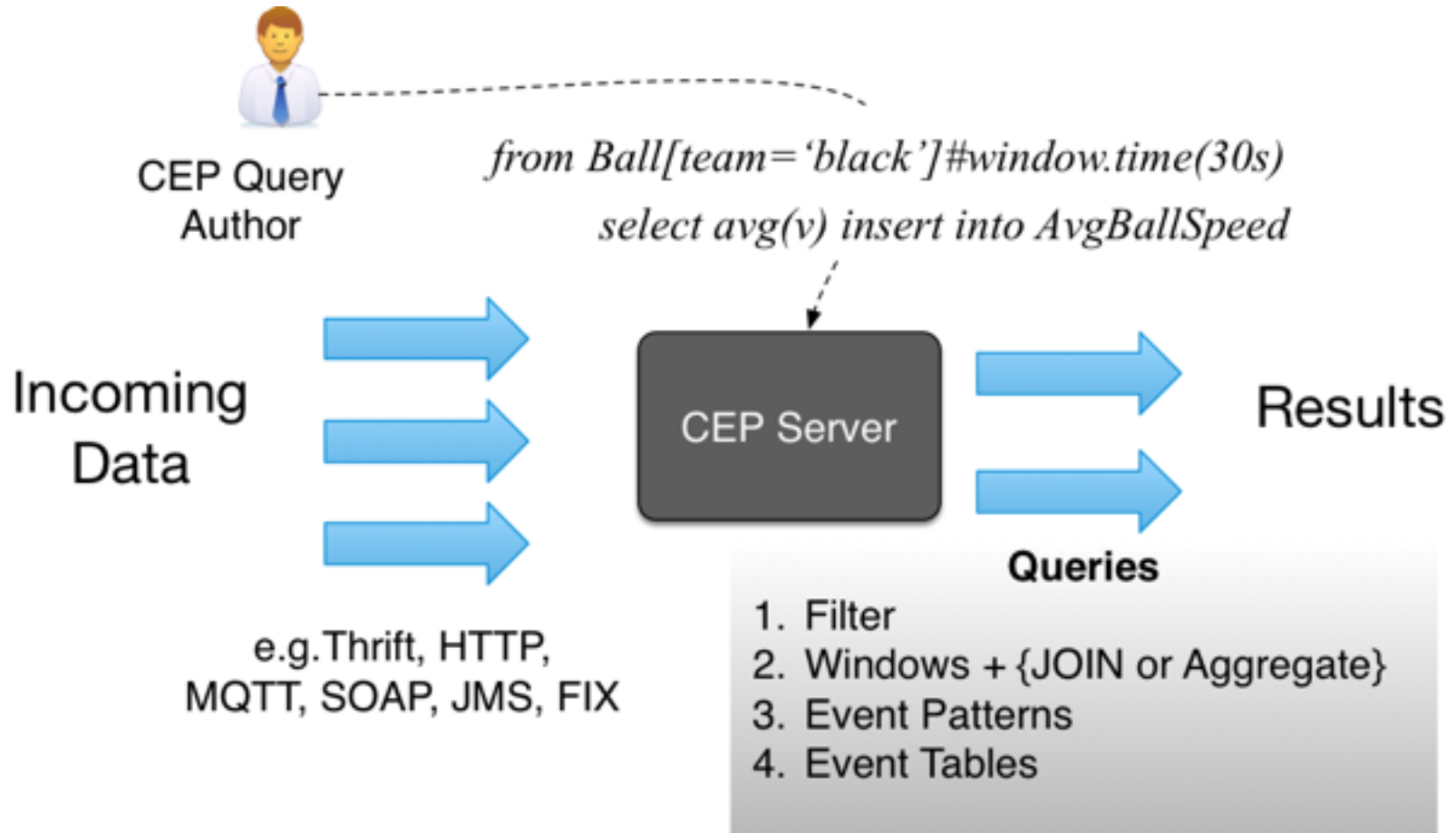
What would take to build such a world?

- Sensors and actuators (Motes?)
- Fast interoperable event systems (MQTT?)
- Powerful query languages (CEP?)
- Powerful control systems and decision systems



**The best way to
predict the future is
to invent it**

Complex Event Processing



CEP Operators

- Filters or transformations (process a single event)
 - `from Ball[v>10] select .. insert into ..`
- Windows + aggregation (track window of events: time, length)
 - `from Ball#window.time(30s) select avg(v) ..`
- Joins (join two event streams to one)
 - `from Ball#window.time(30s) as b join Players as p on p.v < b.v`
- Patterns (state machine implementation)
 - `from Ball[v>10], Ball[v<10]* , Ball[v>10] select ..`
- Event tables (map a database as an event stream)
 - `Define table HitV (v double) using .. db info ..`

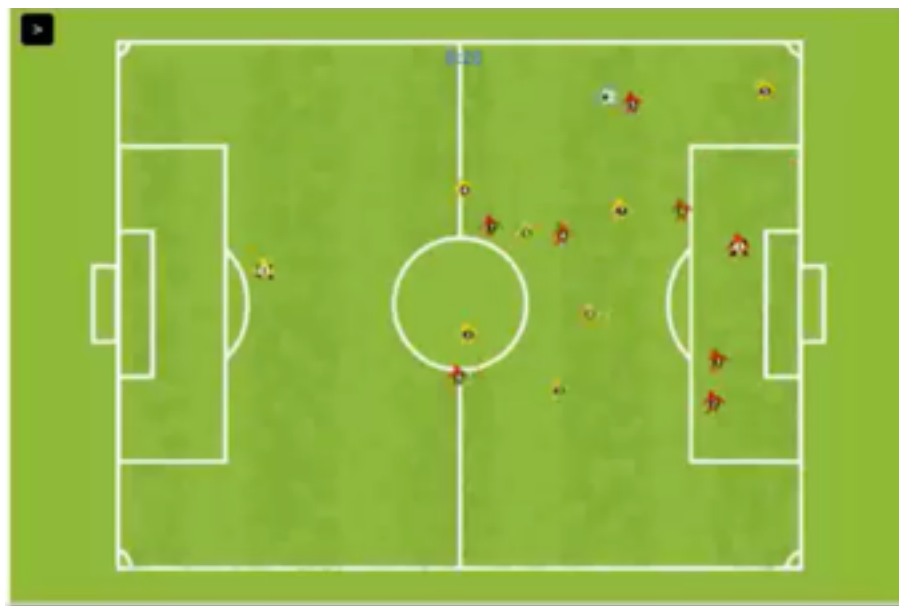
Sport (Soccer) Usecases?

- Dashboard on game status
- Alarms about critical events in the game
- Real-time game analysis and predictions about the next move
- Updates/ stats etc., on mobile phone with customized offers
- Study of game and players effectiveness
- Monitor players health and body functions



DEBS Challenge

- Soccer game, players and ball has sensors (DESB Challenge 2013) sid, ts, x,y,z, v,a
- Use cases: Running analysis, Ball Possession and Shots on Goal, Heatmap of Activity
- WSO2 CEP (Siddhi) did 100K+ throughput



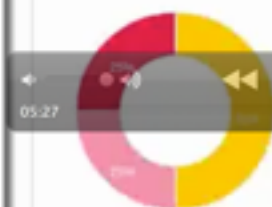
Team-A Players

- 1 Nick Gerke
- 2 Dennis Dötterweich
- 3 Niklas Westermann
- 4 Will Sommer
- 5 Philipp Harbers
- 6 Roman Harbers
- 7 Erik Engelhardt
- 8 Sandro Schneider

Team-B Players

- 1 Leon Krapf
- 2 Kevin Baer
- 3 Luca Ziegler
- 4 Ben Mueller
- 5 Vito Restorini
- 6 Christopher Lee
- 7 Leon Harbers
- 8 Lino Langhans

Shots on Goal



Ball Possession By 1, Leon Krapf, B

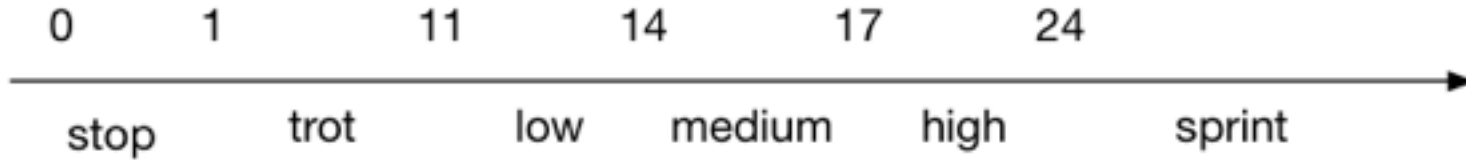
Match Summary

56	Success Passes	01:21
2	Shots on Goal	2
43	Ball Possession %	57

Player's Speed vs Time



Usecase 1: Running Analysis

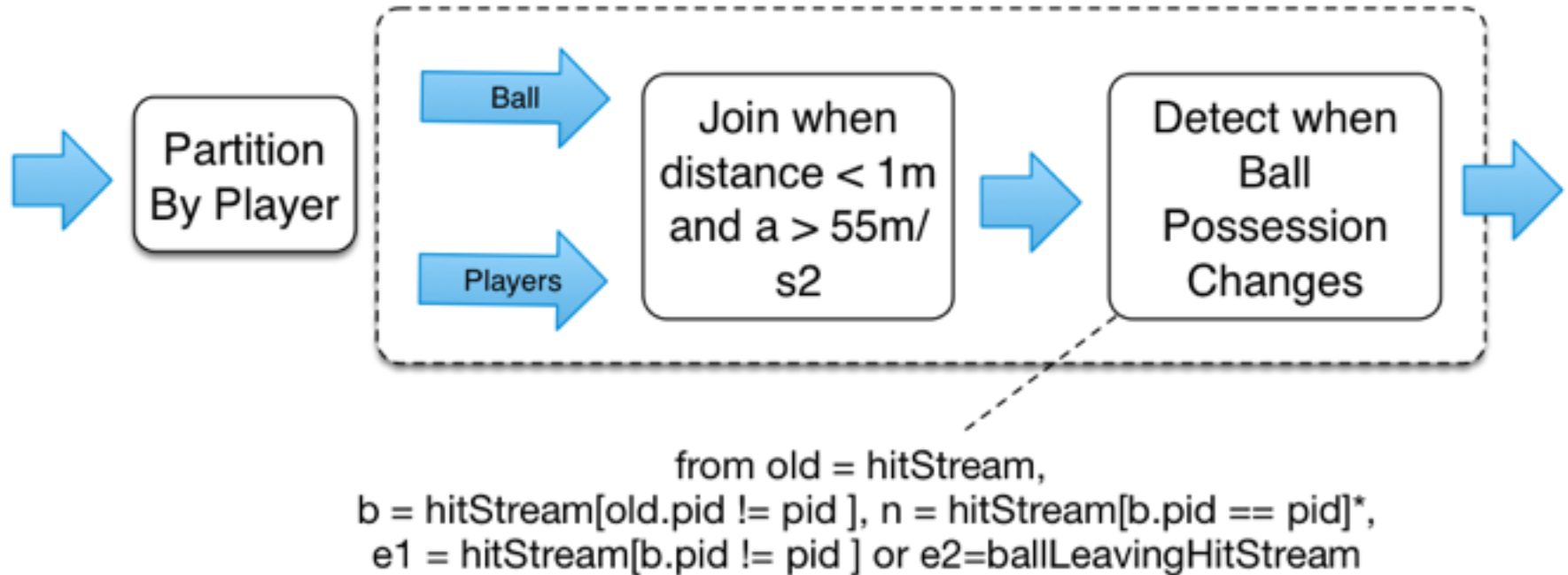


- Main idea: detect when speed thresholds have passed

```
define partition player by Players .id;
from s = Players [v <= 1 or v > 11] ,
    t = Players [v > 1 and v <= 11]+ ,
    e = Players [v <= 1 or v > 11]
select s.ts as tsStart , e.ts as tsStop , s.id as playerId ,
    ``trot" as intensity , t [0].v as instantSpeed ,
    (e.ts - s.ts )/1000000000 as unitPeriod
insert into RunningStats partition by player;
```

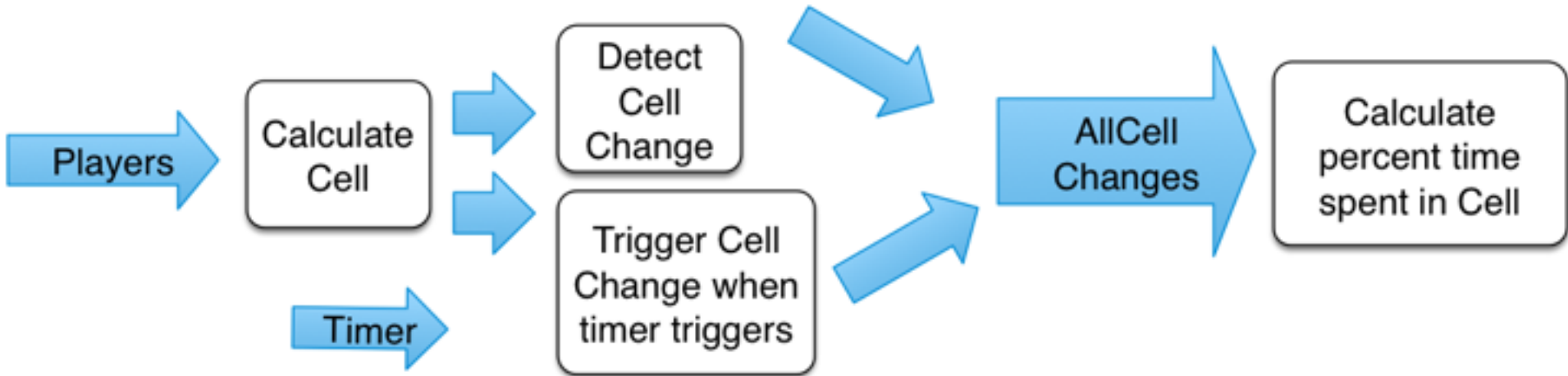
Usecase 2: Ball Possession

- Ball possession (you possess the ball from time you hit it until someone else hit it or ball leaves the ground)



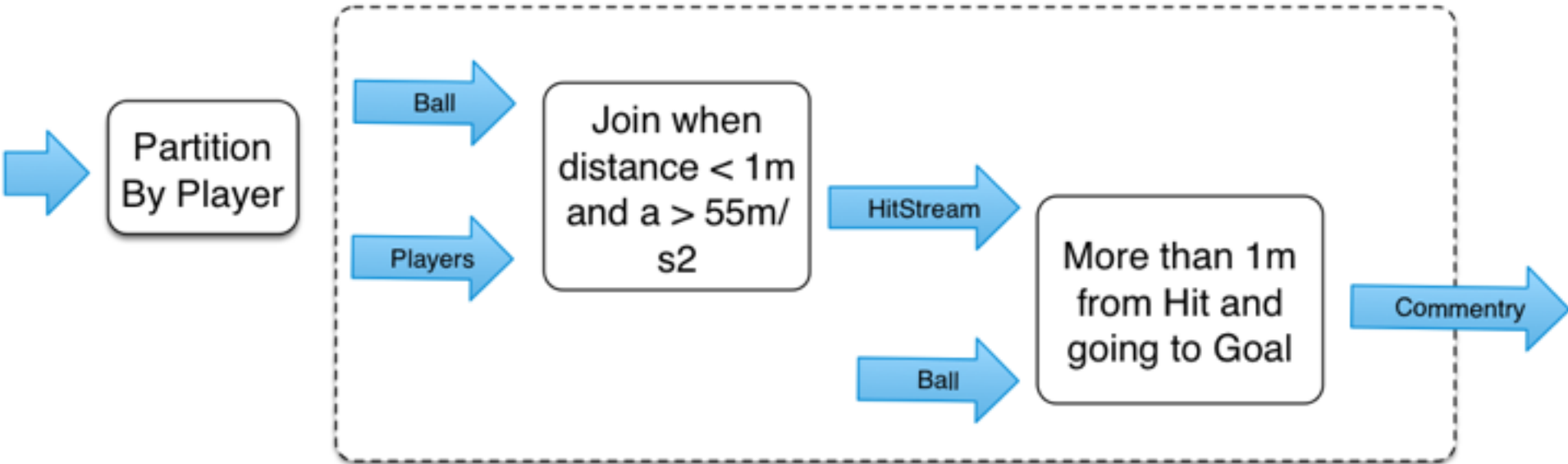
Usecase 3: Heatmap of Activity

- Show where actions happened (via cells defined by a grid of 64X100 etc.), need updates once every second
- Can solved via cell change boundaries, but does not work if one player stays more than 1 sec in the same cell. So need to join with a timer.



Usecase 4: Detect Kicks on the Goal

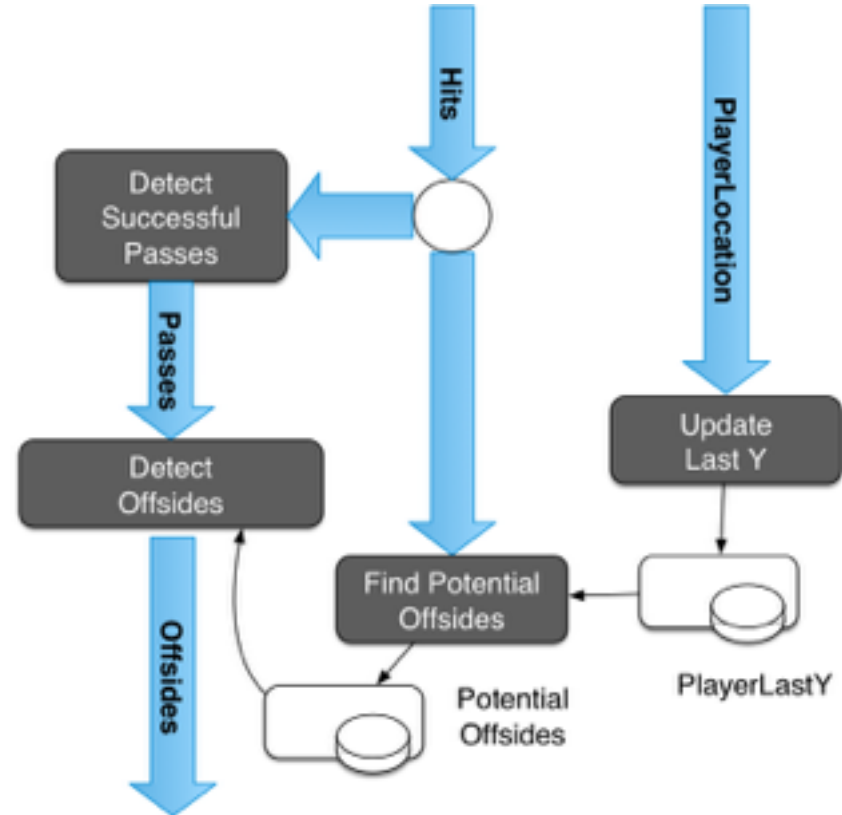
- Main Idea: Detect kicks on the ball, calculate direction after 1m, and keep giving updates as long as it is in right direction



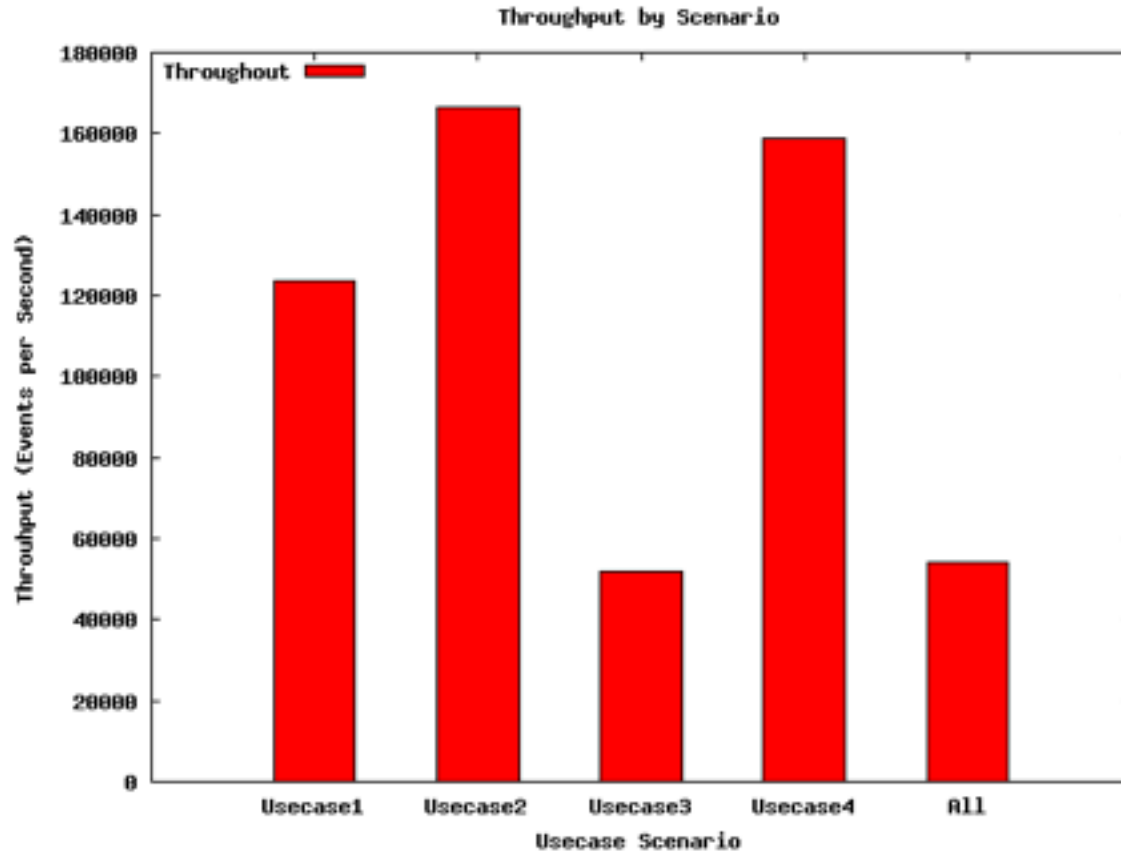
New Usecase: Offside Detection



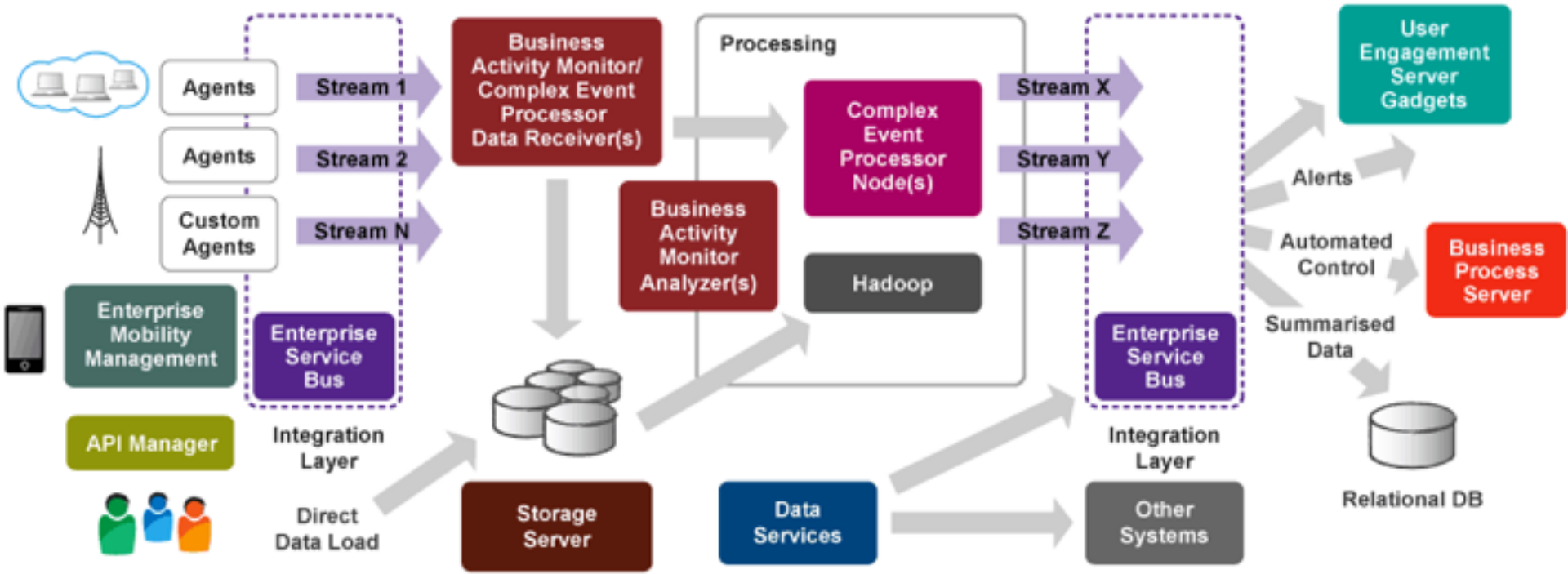
- If you have gone passed the last defender at time of a kick, you are in a offside position.
- If you are part of that play after, it is foul



Results for DEBS Scenarios



WSO2 Big Data Platform



Other Applications

- System/ Device Management
- Fleet/ Logistic Management
- Fraud Detection
- Targeted/ Location Sensitive Marketing
- Smart Grid Control
- Geo Fencing
- ...

Conclusion

- We are heading for a deeply integrated world with real-time detection and actions
 - We have technology to do this now. E.g. (DEBS usecases)
 - Power of CEP
 - Use real-time and batch processing in tandem
- All the software we discussed are *Open source* under Apache License. Visit <http://wso2.com/>.
- Like to integrate with us, help, or join? Talk to us at Big Data booth or architecture@wso2.org



Thank You