

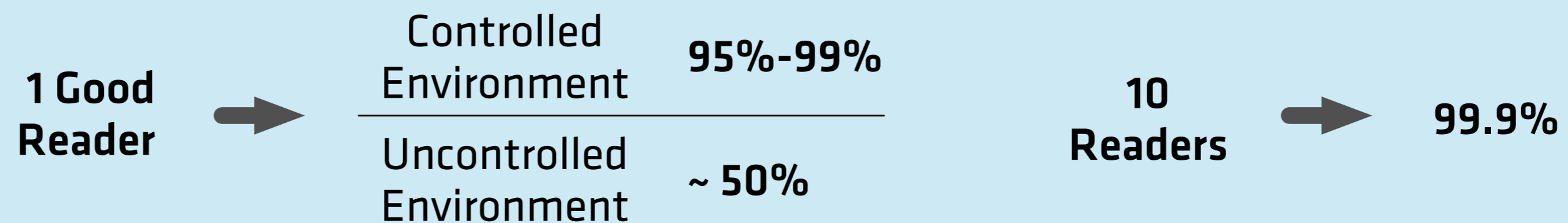
# Reduce RFID implementation costs with Middleware improvements

## Problem

Designing RFID systems has several constraints, one of them is its **unreliable nature** that prevents wide adoption.

**Approach:** Provide more readers to cover the same area. Problem: **High implementation costs!**

Read Rate:

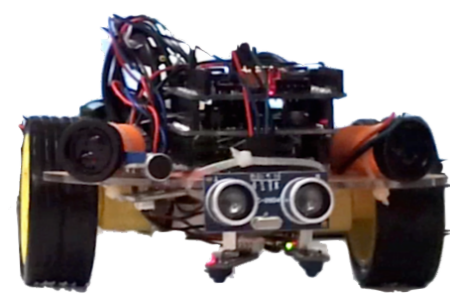


## Proposed Improvement

Redesign Fosstrak's data cleaning module with adaptive sliding window technique to reduce erroneous reads. We implemented **SMURF (Statistical sMoothing for Unreliable RFid)** and we want to improve it with behavior characteristics and Intemec's ARX (Advanced RFID Extensions) technology.

## Open Questions

1. Which ARX properties should we use?
2. Can previous knowledge of the business scenario further improve the data cleaning module?
3. What business case/scenario can we apply here?

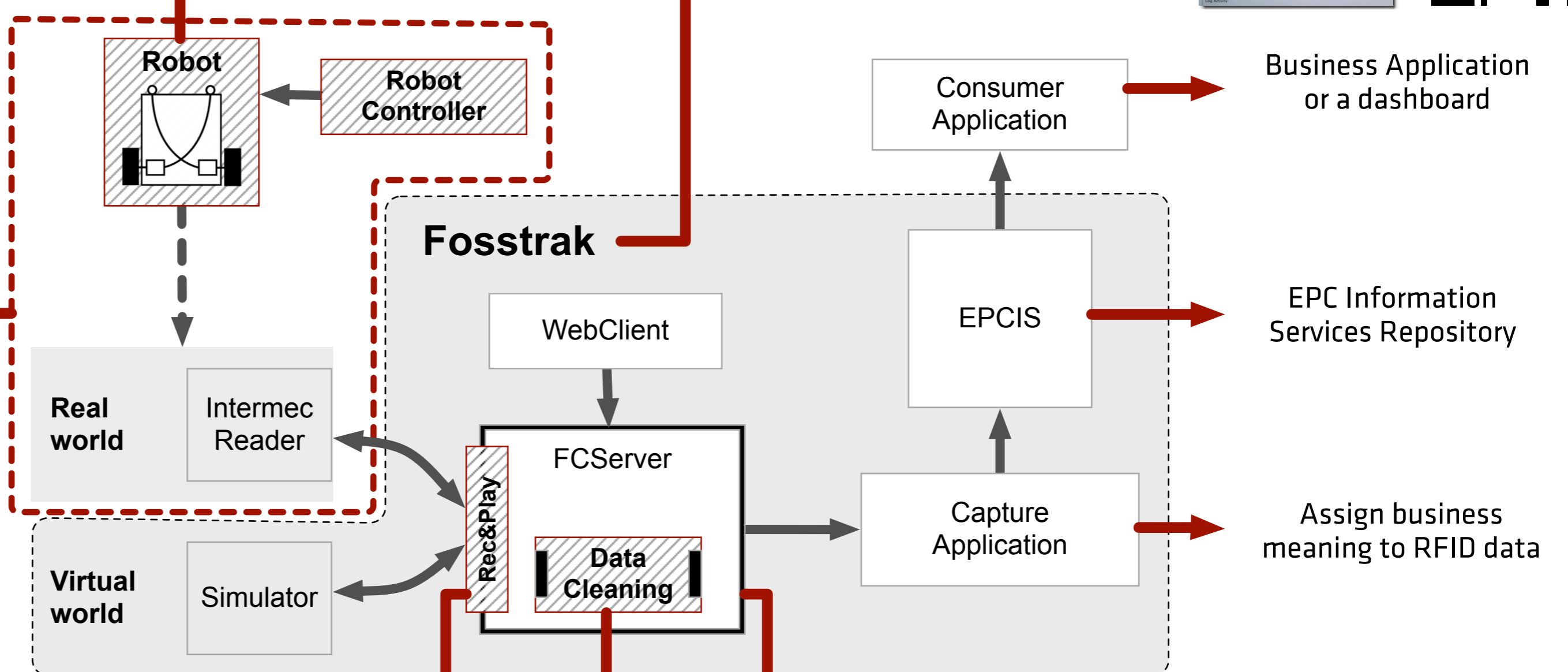


### Arduino Robot was developed

to reproduce business actions more easily. Receives a set of simple instructions through its bluetooth connection.

Concrete business scenarios can be simulated using our Arduino Robot.

Industry readers allow us to obtain data produced by *real readers*.



**Rec&Play was developed** to record a sequence of LLRP (Low Level Reader Protocol) messages. Later these sequences are replayed to test several scenarios.

These sequences represents real world data and are used to make sure we maintain all the *natural* errors along our experience repetitions.

Tests made upon Rec&Play showed that 95% of the events were delivered at exact time. The maximum delay observed was 5ms and the order was guaranteed.

**SMURF was implemented** as part of Fosstrak's data cleaning mechanism. It views RFID data streams as a statistical sample of tags in the physical world. SMURF continuously adapt tag's sliding window size using sampling theory techniques.

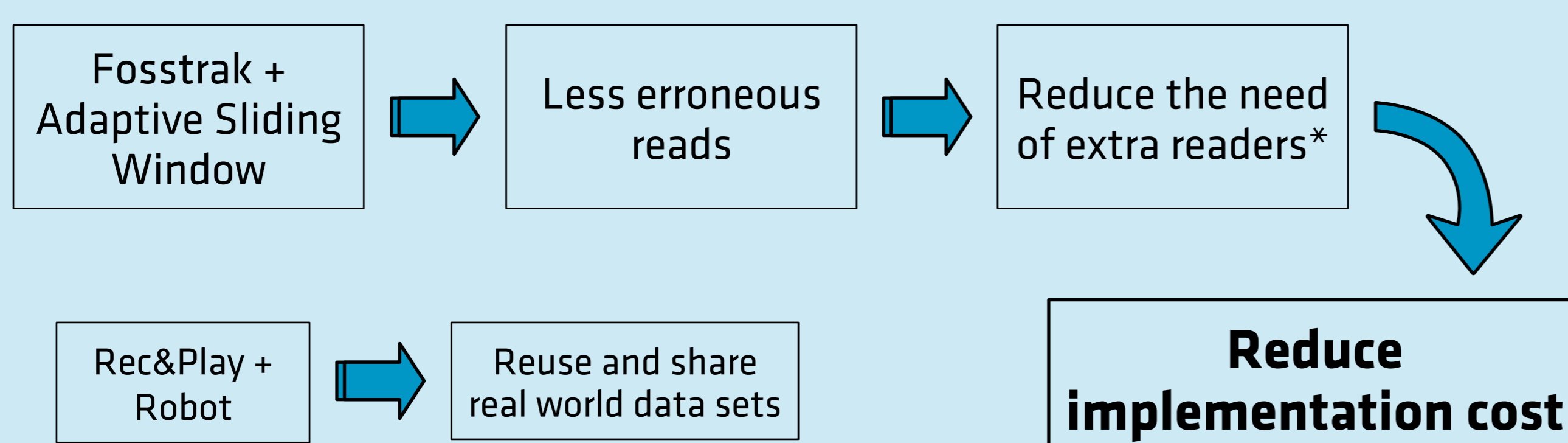
So far, results showed an **improved read rate** comparing with the static window strategy.

Filtering and Collection Server receives all readers events and filter and aggregates data.

**FCServer was improved** with debug information using Java's JMX MBeans technology.

## Conclusions

\* the results achieved so far is not enough to reduce the number of readers, research should continue to improve even more these results.



## Literature:

- C. Floerkemeier, C. Roduner, and M. Lampe, "RFID Application Development With the Accada Middleware Platform," IEEE Systems Journal, vol. 1, no. 2, pp. 82-94, Feb. 2007.
- S. R. Jeffery, M. Garofalakis, and M. J. Franklin, "Adaptive cleaning for RFID data streams," VLDB '06: Proceedings of the 32nd international conference on Very large data bases, Sep. 2006.

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## Quick Answers:

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