International Conference on Internet of Things, Big Data and Security 2020

SCALABLE LOGISTIC CELL RFID WITNESS MODEL

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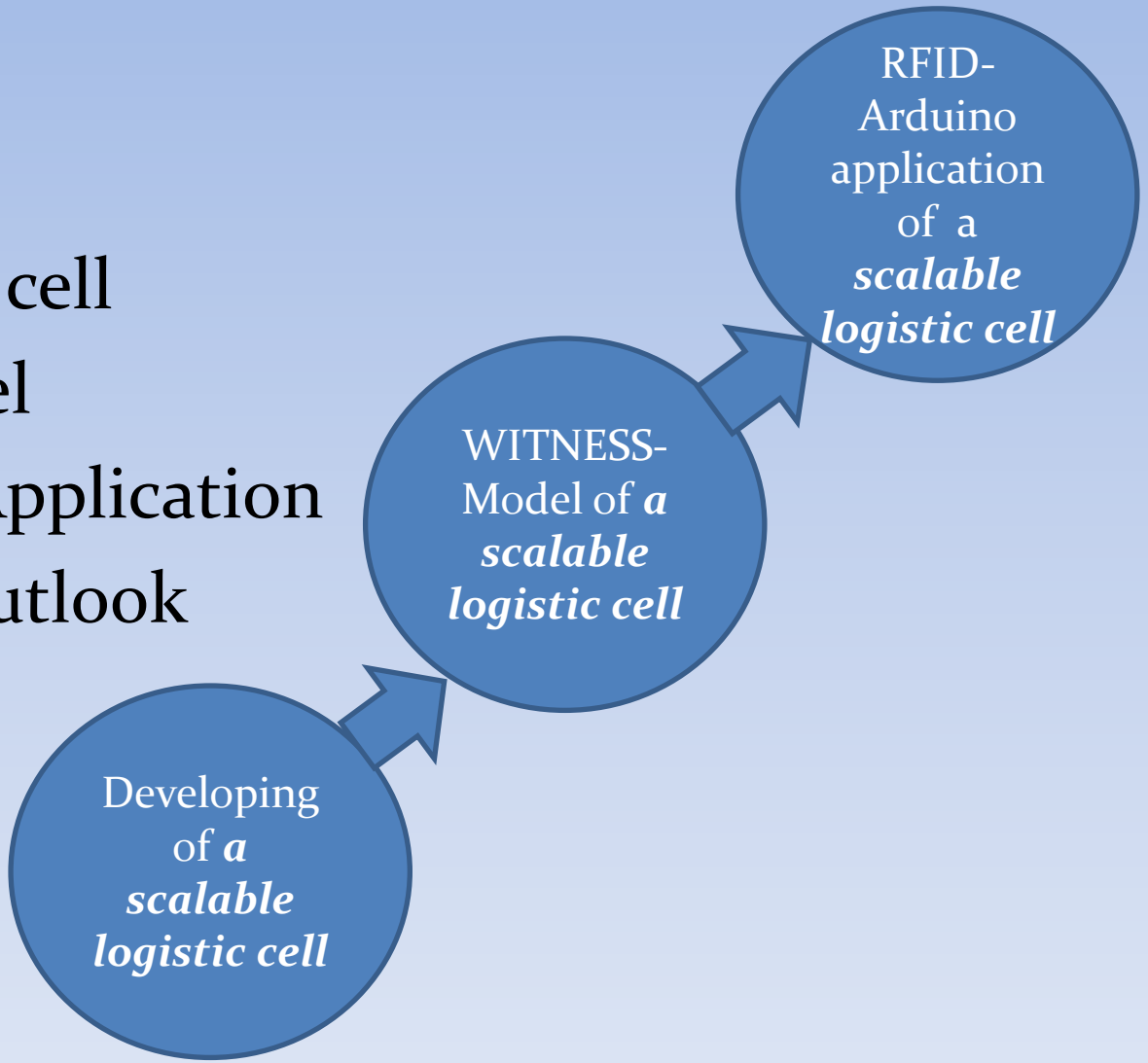
Virtual Online Poster Presentation: 8.5.2020 16h30-17h30

Agenda

- Work structure
- Scalable logistic cell
- WITNESS-Model
- RFID-Arduino Application
- Summary and outlook
- References



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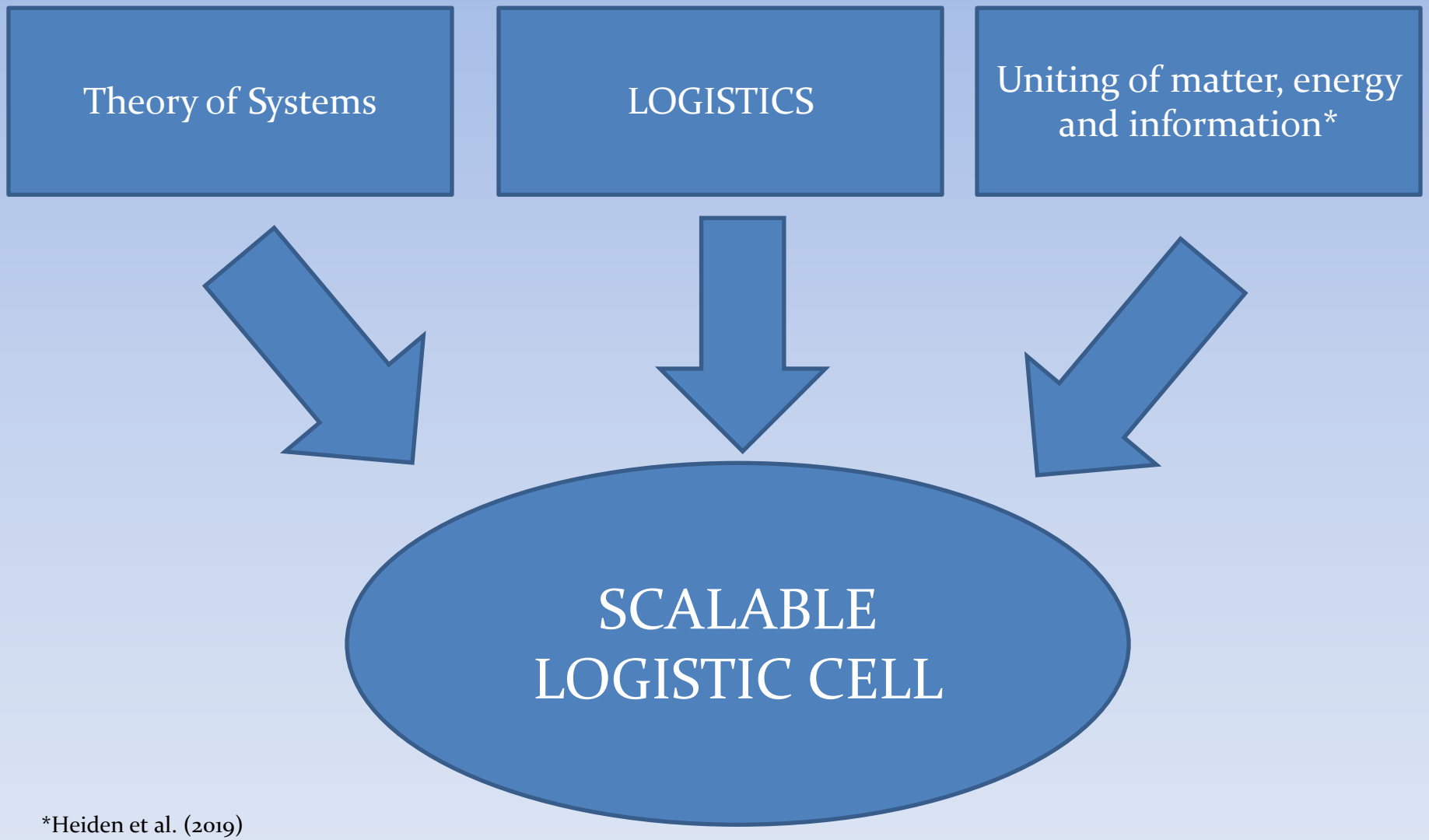
Scalable logistic cell



*Heiden et al. (2019)

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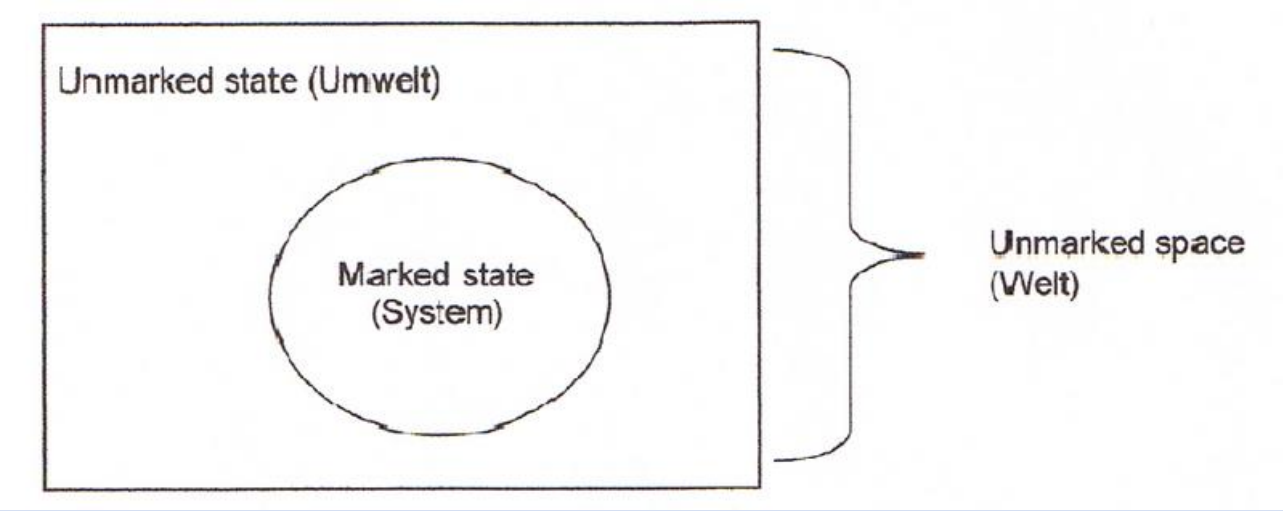
Theory of Systems

"The system appears from the separation as a ***marked state*** (system) from the ***unmarked state*** (external world)" *(G. Spencer-Brown "Laws of form").*



Appearance of a system in the theory of George Spencer-Brown (Spencer-Brown, 2008)

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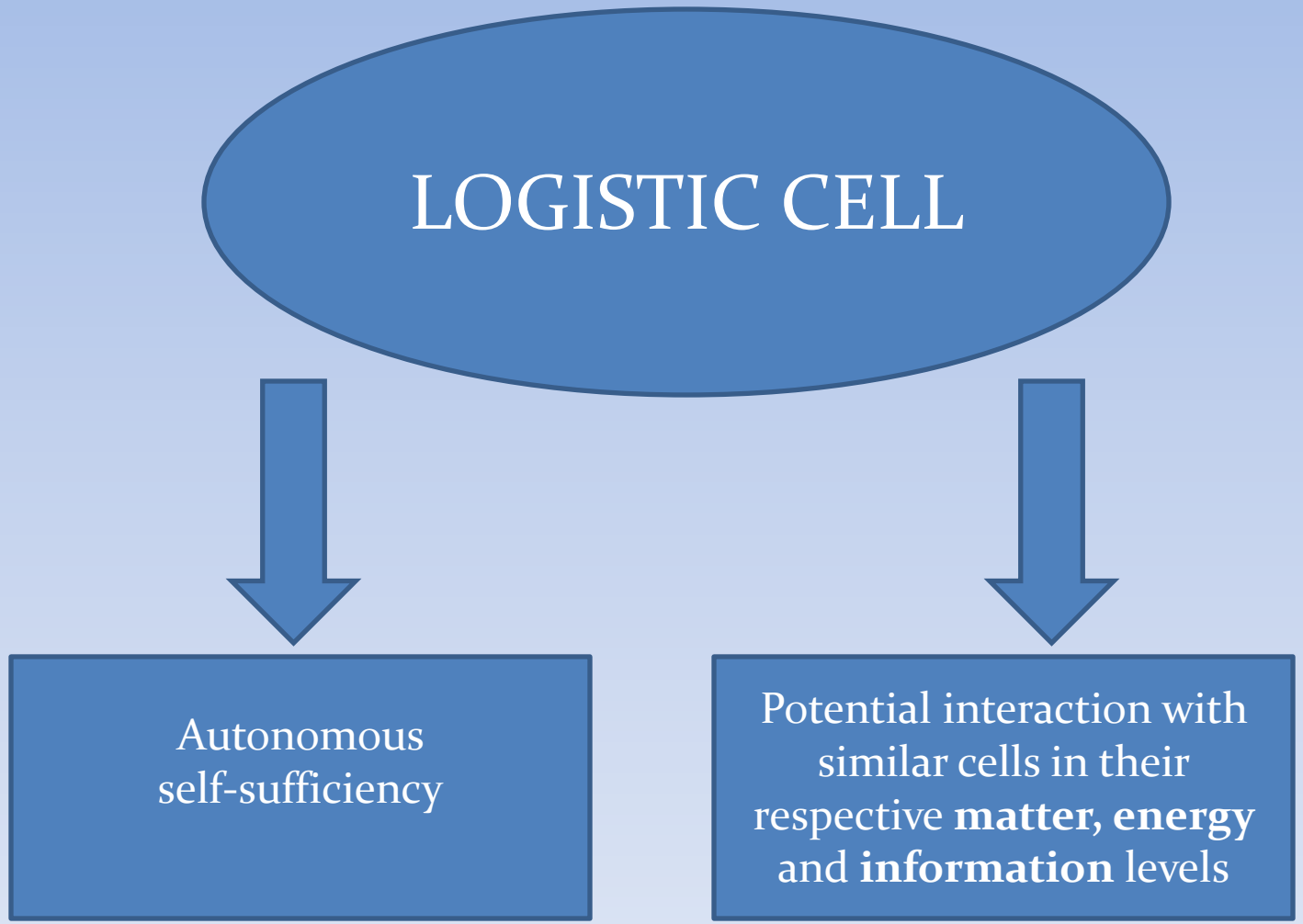
Functional interaction of a logistic cell



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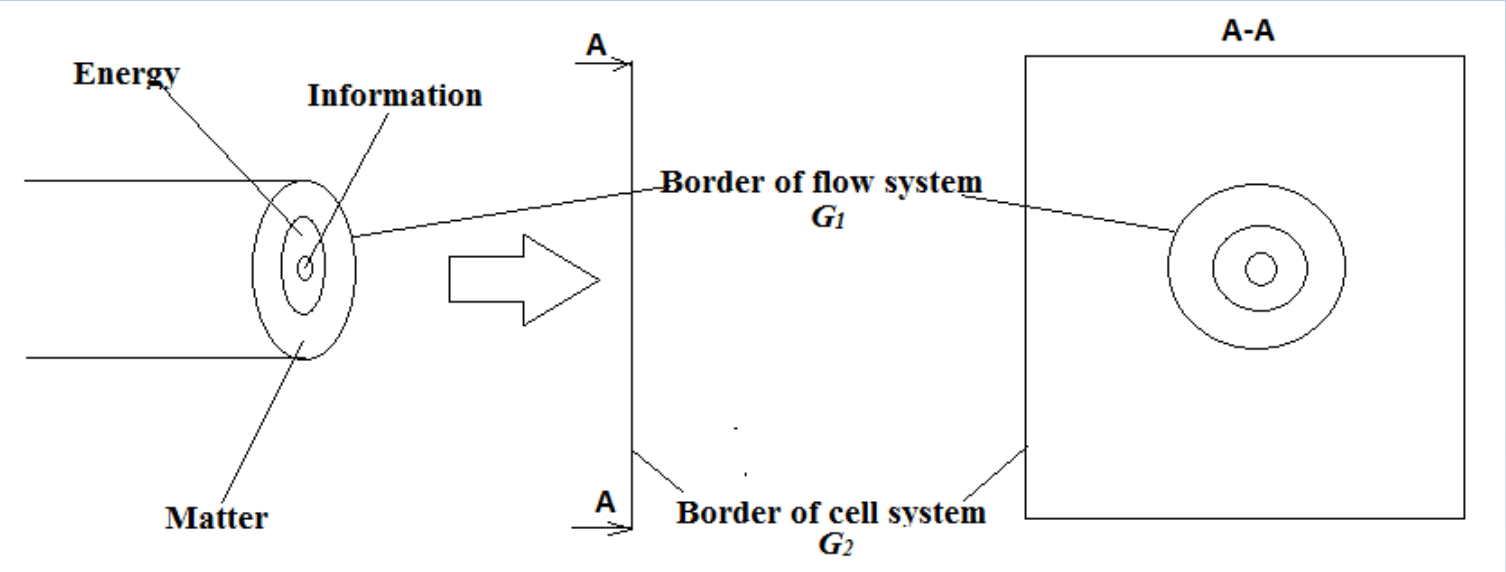
Scalability of logistic cell

- Can be understood as the property of a logistic cell that allows for applying **volume and/or size changes** in the system.
- **borders** of logistic cells are **strongly connected** with the borders of flows (the bigger is the Material-Energy-Information (MEI)-flow, the bigger is the ”input surface” and with it tendentiously the cell).



Dependence between Borders of Flow System and Cell System

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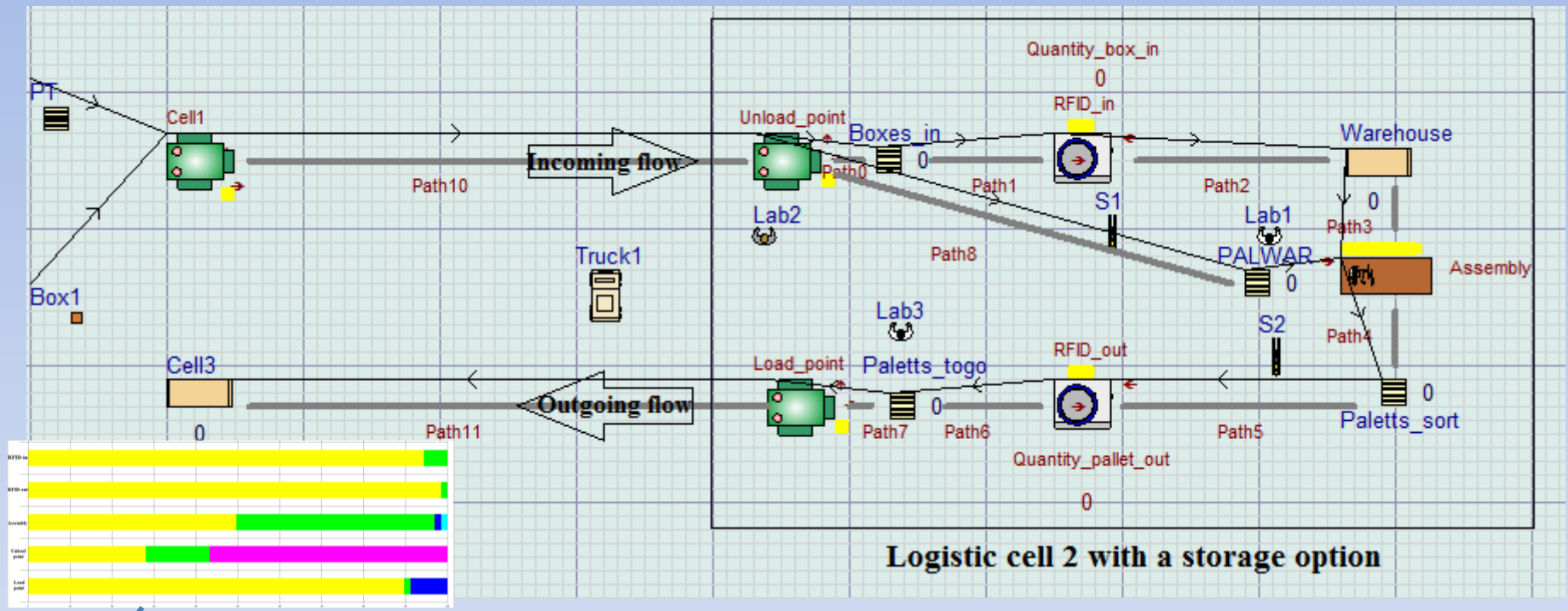
WITNESS-Model simulation process



Bottleneck analysis*

Logistic Cell with a Storage Option in the Witness Model

The model consists of the considered **logistic cell with a storage option** (cell 2) and schematically depicts **cell 1** and **cell 2**, which play the role of e.g. the **supplier** and the **customer** respectively.

*examples see also Leporis and Kralova (2010).

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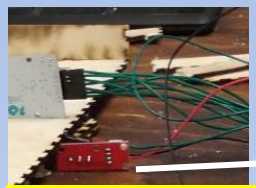
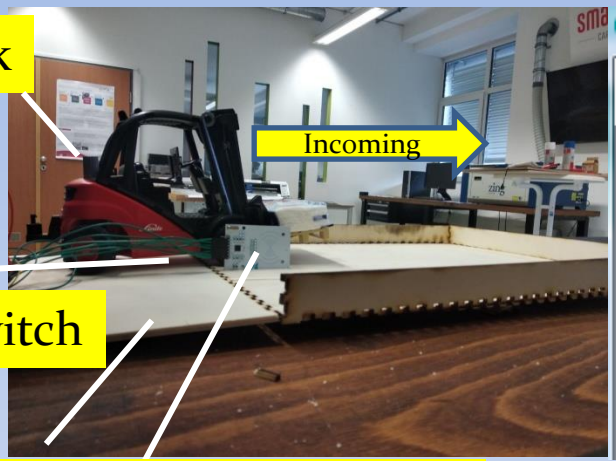
Model work principle

Arduino IDE monitor port

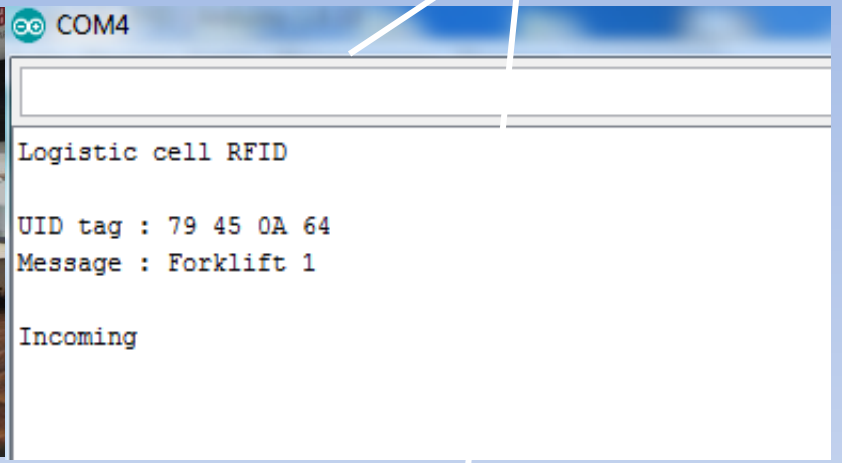
forklift truck



endstop-switch

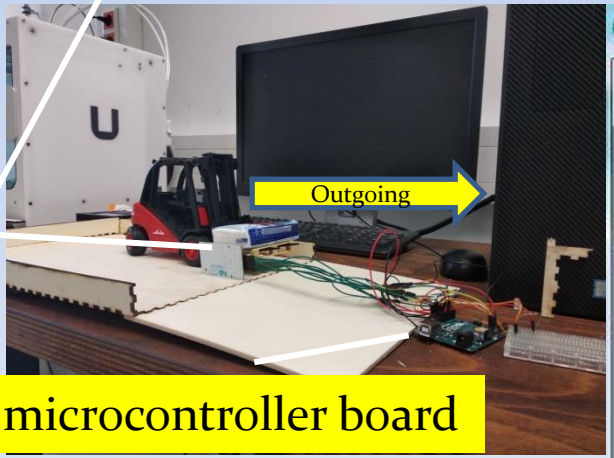


board, made from plywood sheet

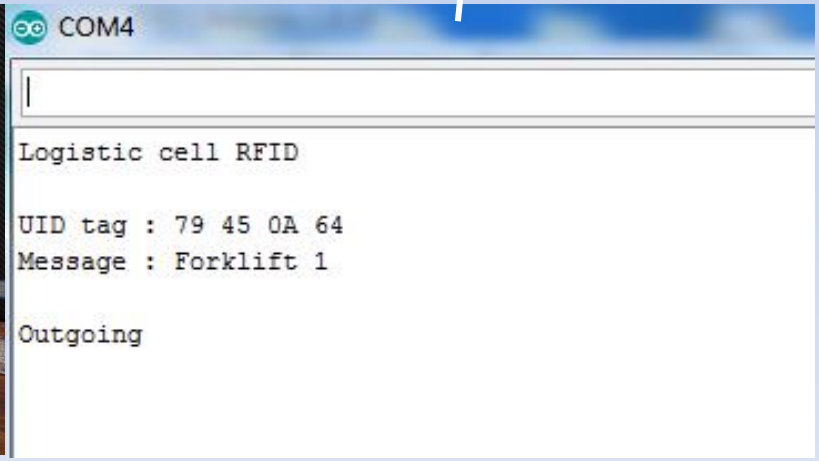


Incoming process

RFID-Reader



Arduino microcontroller board



Outgoing process

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Summary and outlook

Results:

- Concept of scalable logistic cell developed
- Simulation in WITNESS done → first results
- IoT – RFID – application → material, energetic and informational transport process

Future research applications:

- Decision processes with Artificial Intelligence (AI) → e.g. WITNESS and PROLOG* combination.

* language foundations see also Sterling and Shapiro (1994)

THANK YOU FOR YOUR ATTENTION!

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PS.: The presentation is also available at: http://www.dr-heiden.com/Vortraege.htm

References:

- Leporis, M. and Kralova, Z. (2010). A simulation approach to production line bottleneck analysis. In *International Conference February 10 - 13, 2010, CYBERNETICS AND INFORMATICS*.
- Spencer-Brown, G. (2008). *Laws of Form*. Bohmeier, Joh.
- Sterling, L. and Shapiro, E. (1994). *The Art of Prolog*. MIT Press.
- Heiden, B., B. Tonino-Heiden, M. Roth, P. Nicolay, X. Mingxing, S. Walder, W. Wissounig and W. Maat (2019). Orgiton Theory (unpublished work).