

## Towards Probabilistic Timing Analysis for SDFGs on Tile Based Heterogeneous MPSoCs



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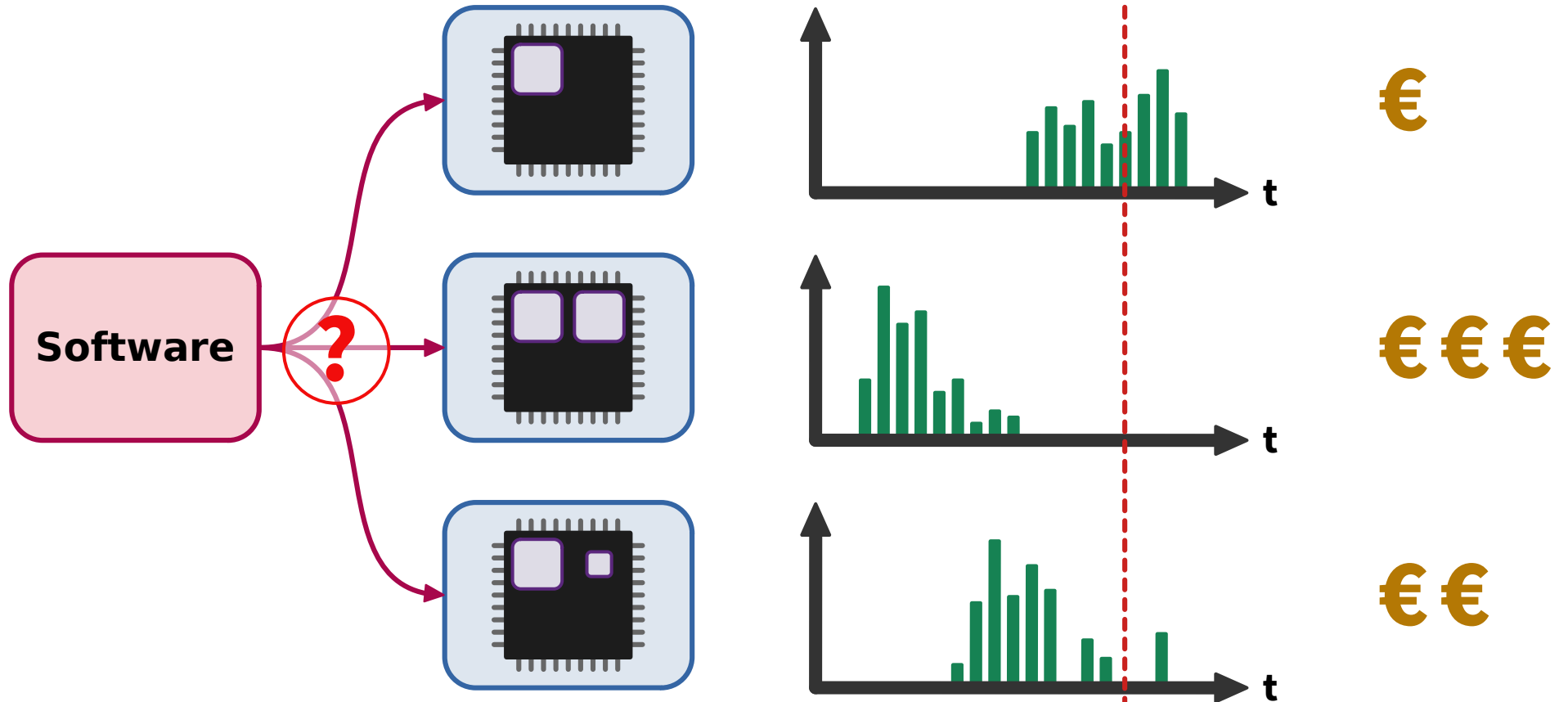
<sup>2</sup> University of Nantes, France

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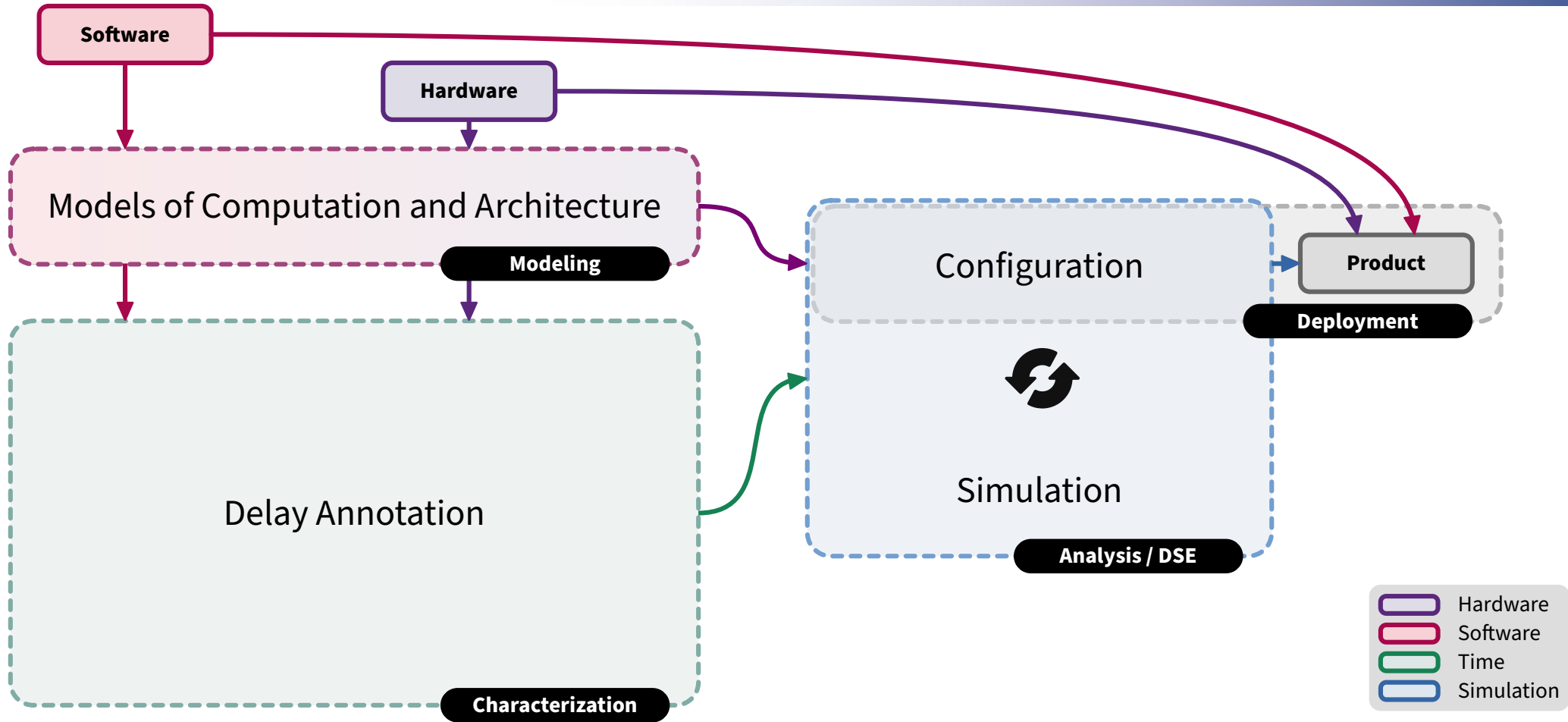
ERTS'20, France, 29<sup>th</sup> January 2020

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CampusFrance with funds from the French Ministry of Europe and Foreign Affairs (MEAE) and  
by the French Ministry for Higher Education, Research and Innovation (MESRI)

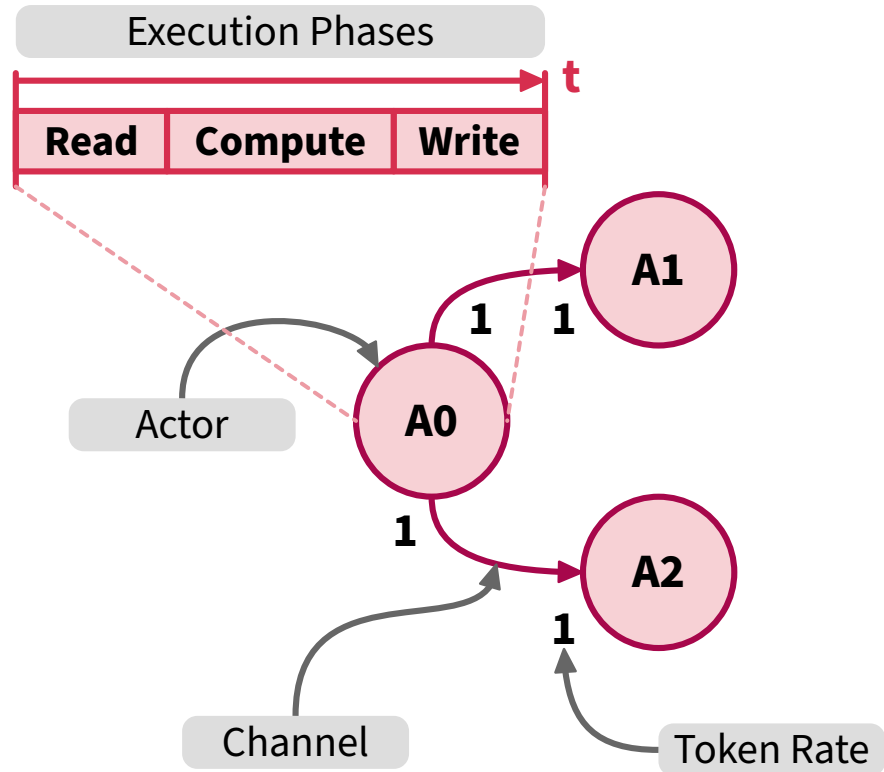
# Motivation



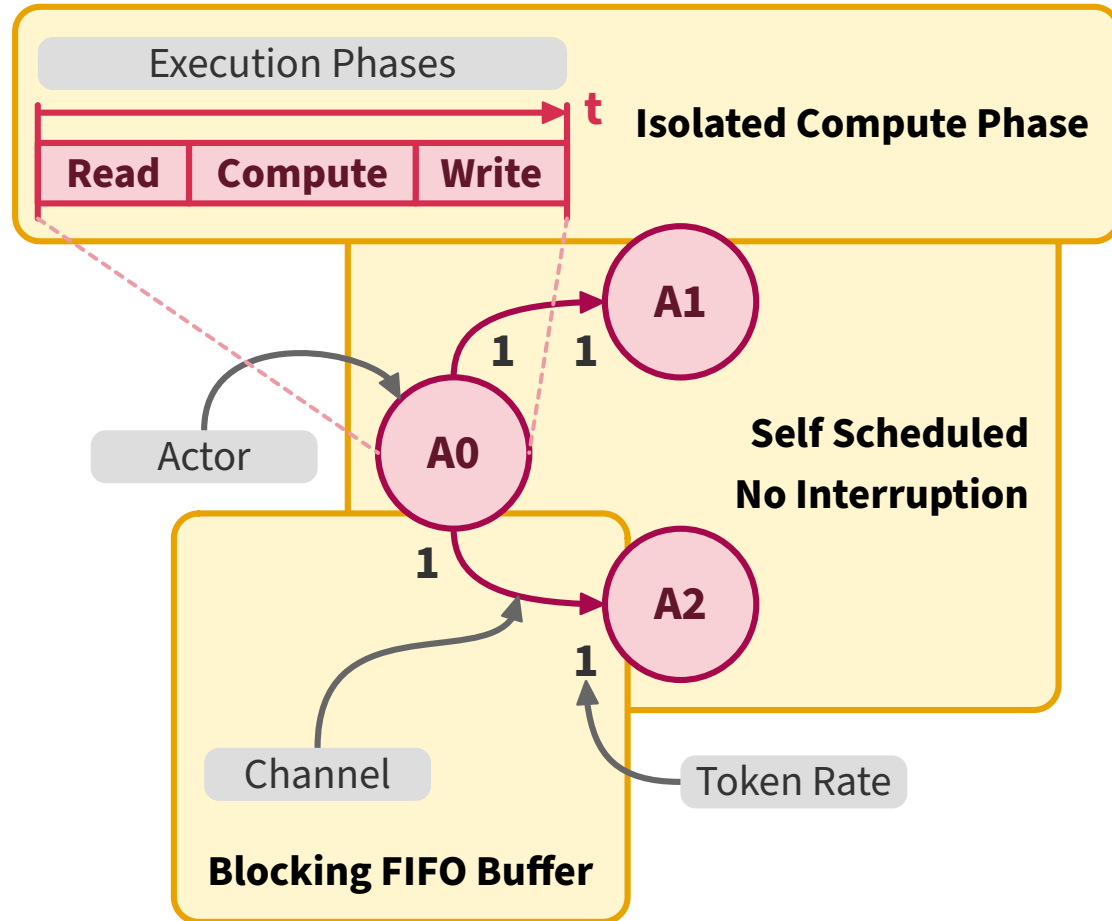
# Approach



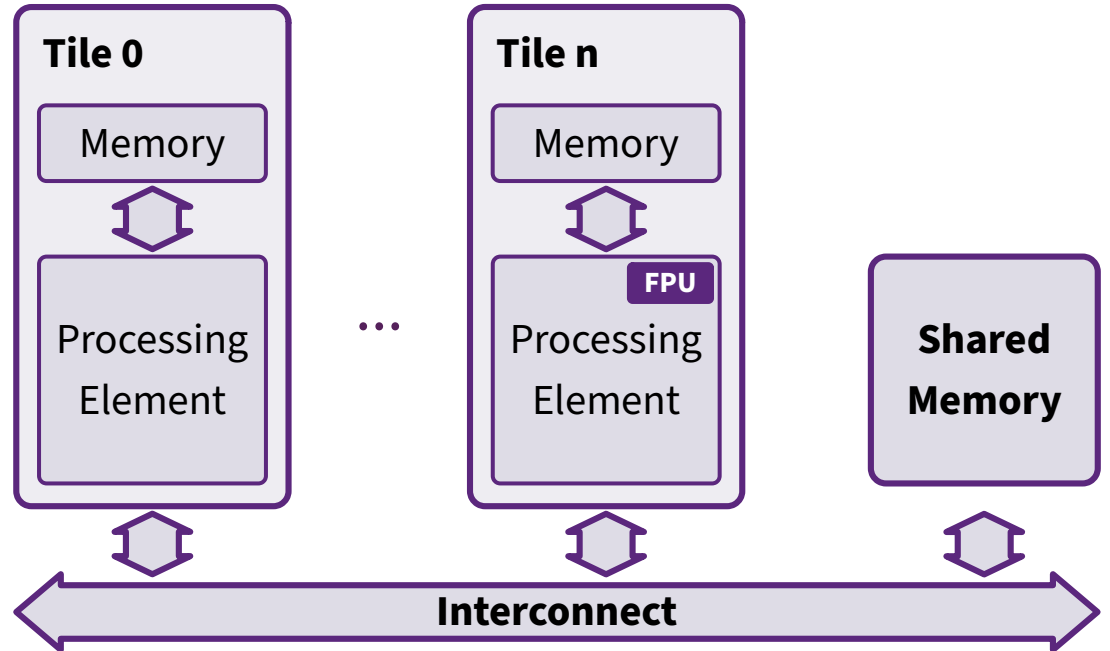
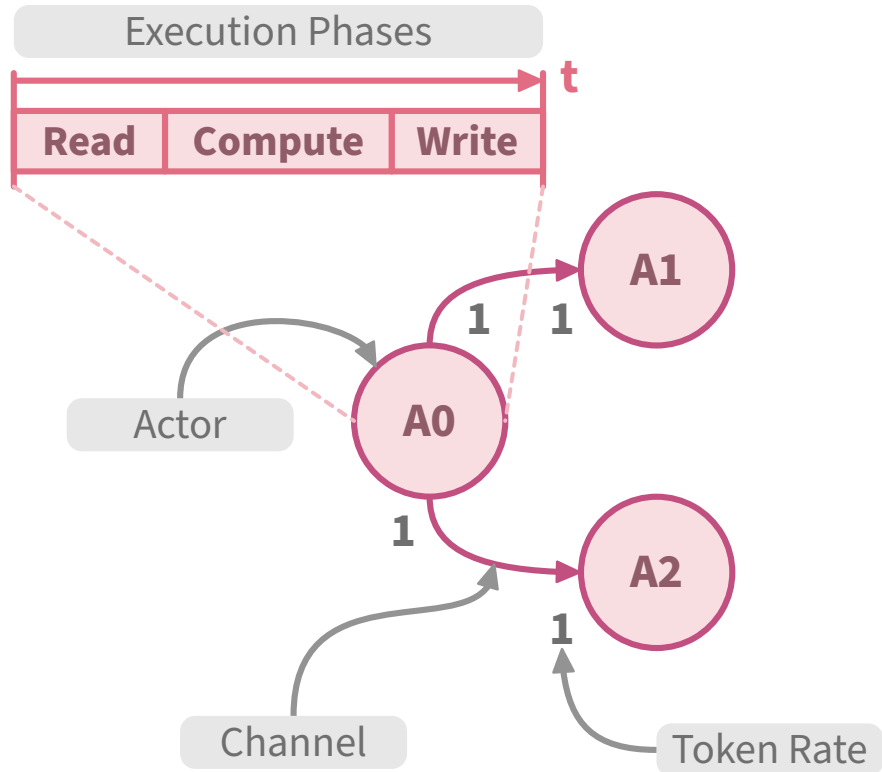
# Computation Model



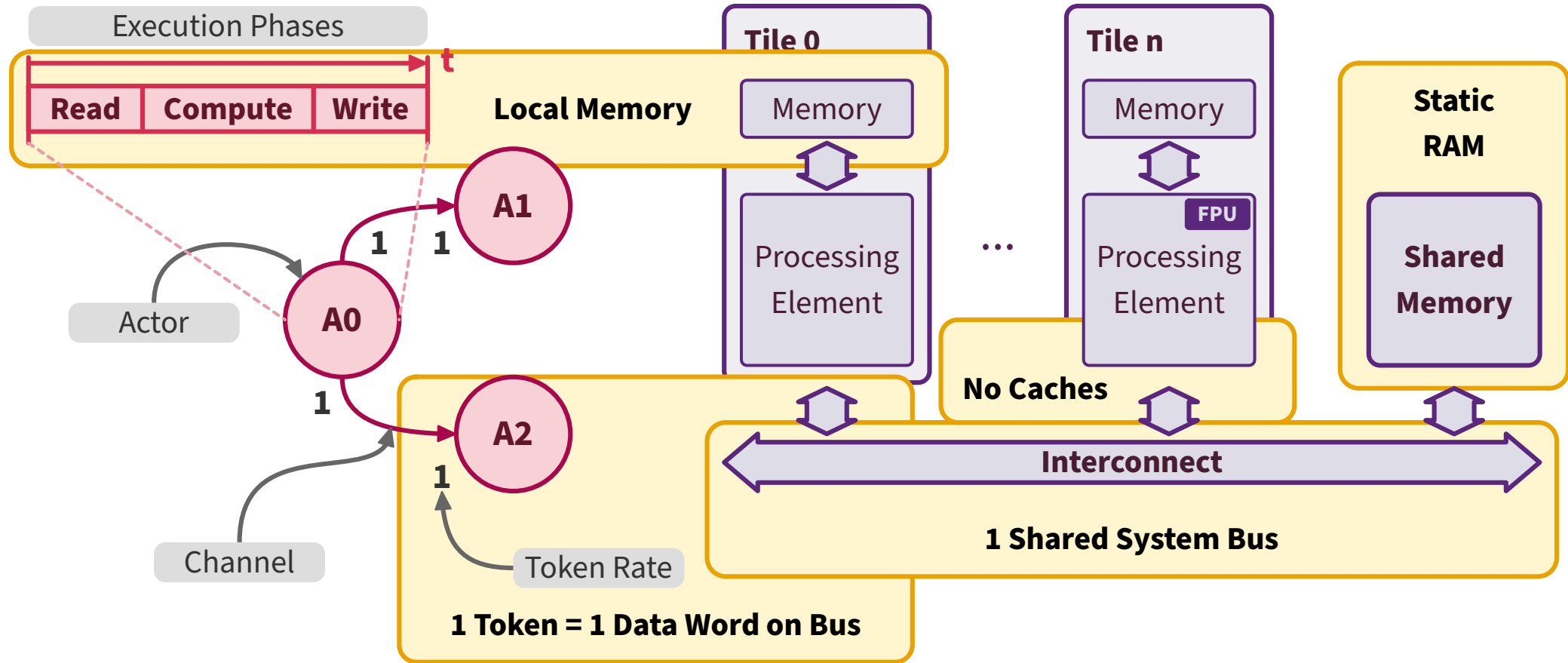
# Computation Model: Constraints



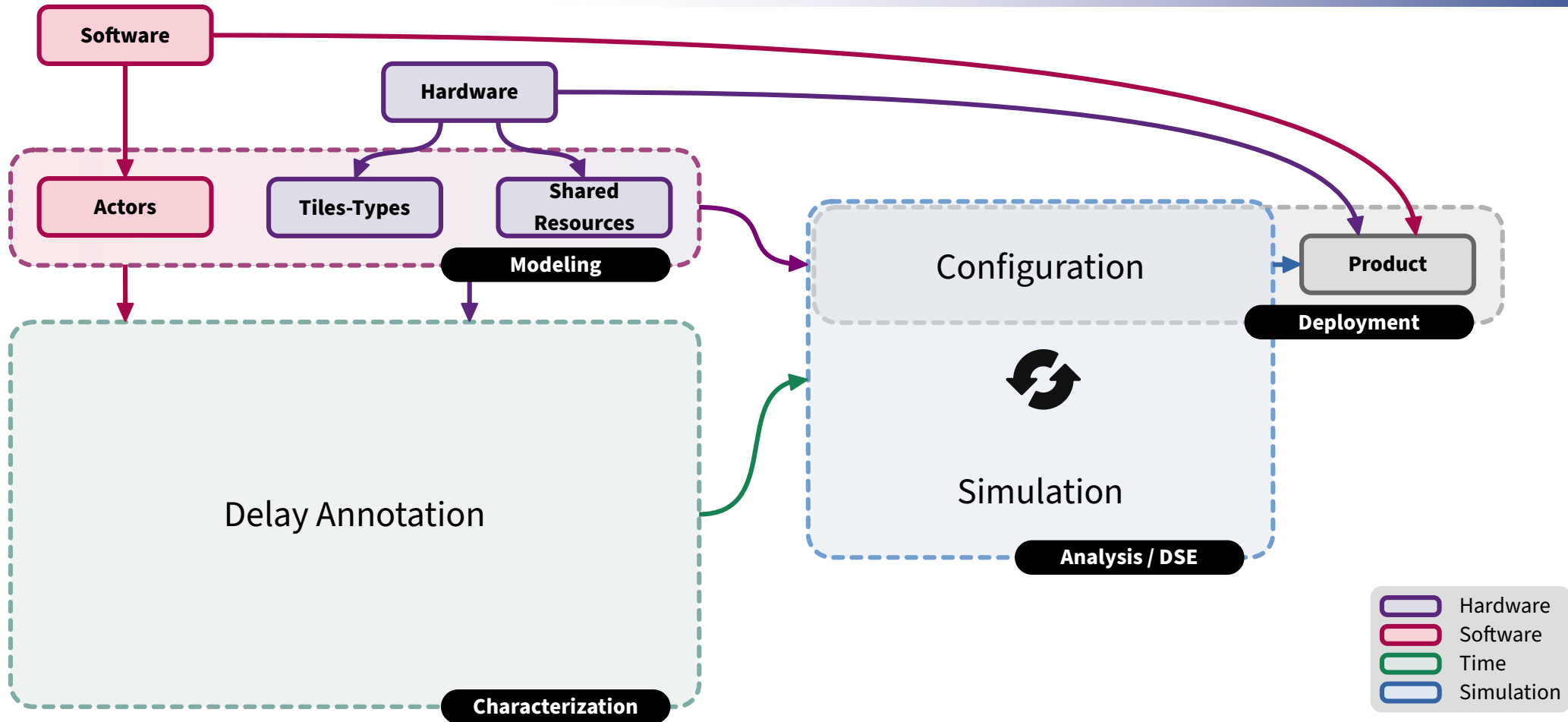
# Platform Model



# Platform Model: Constraints

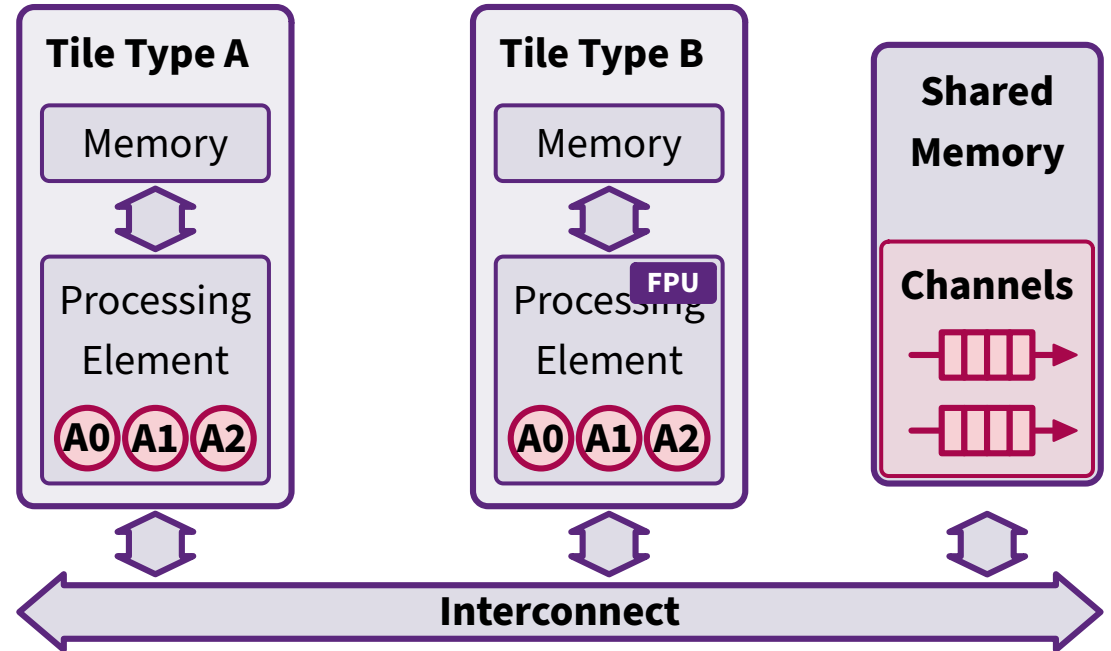
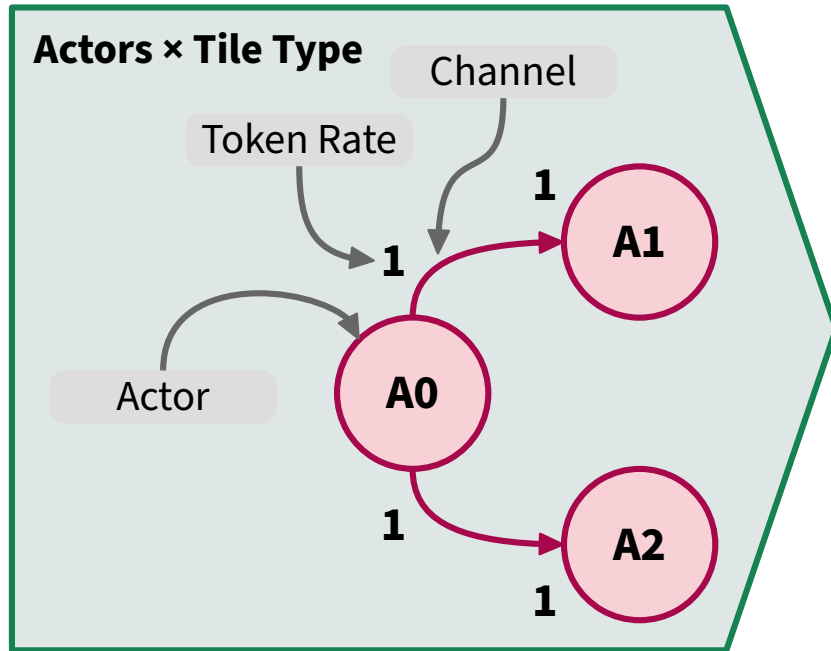


# Designflow: Modeling

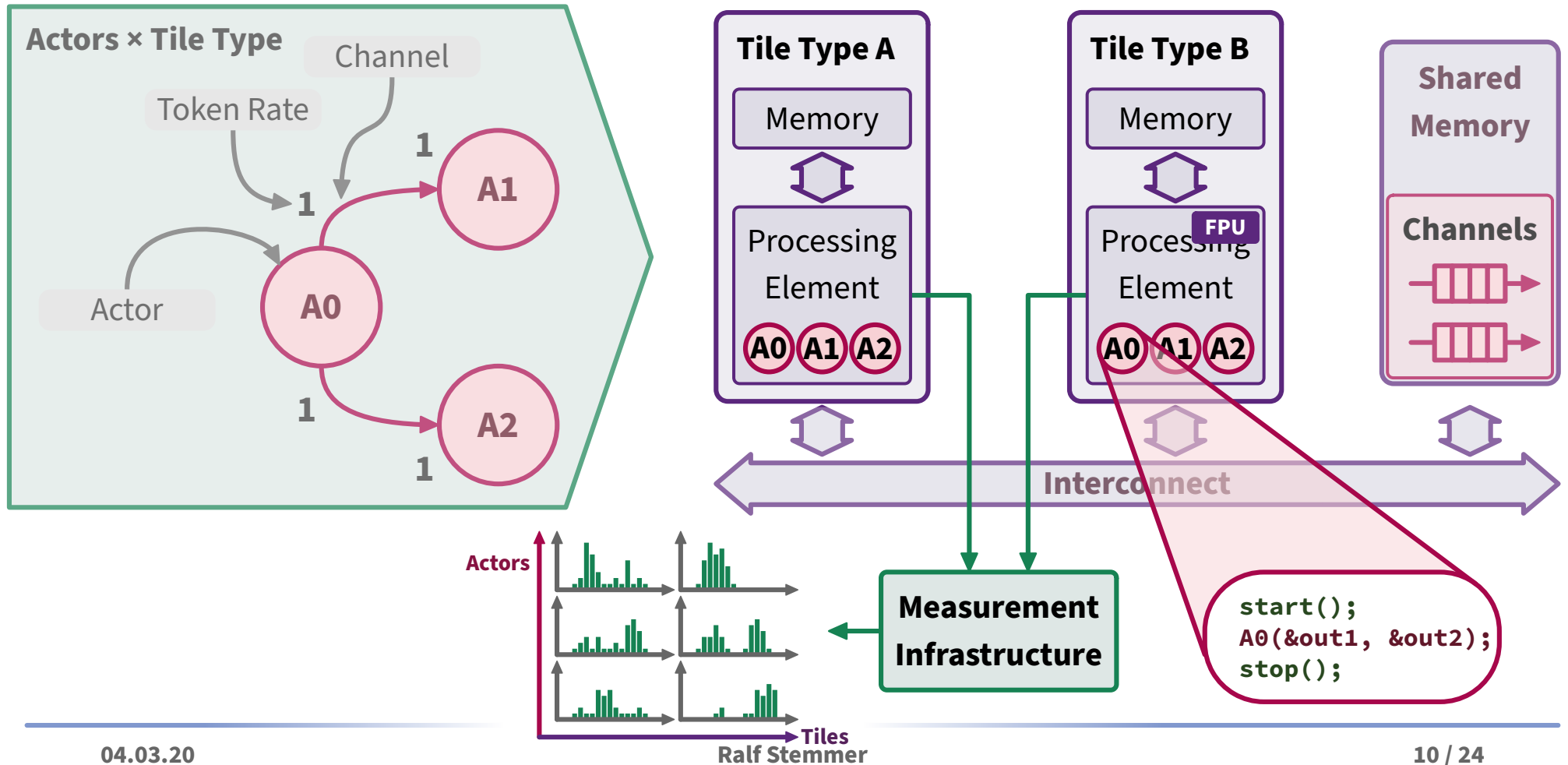




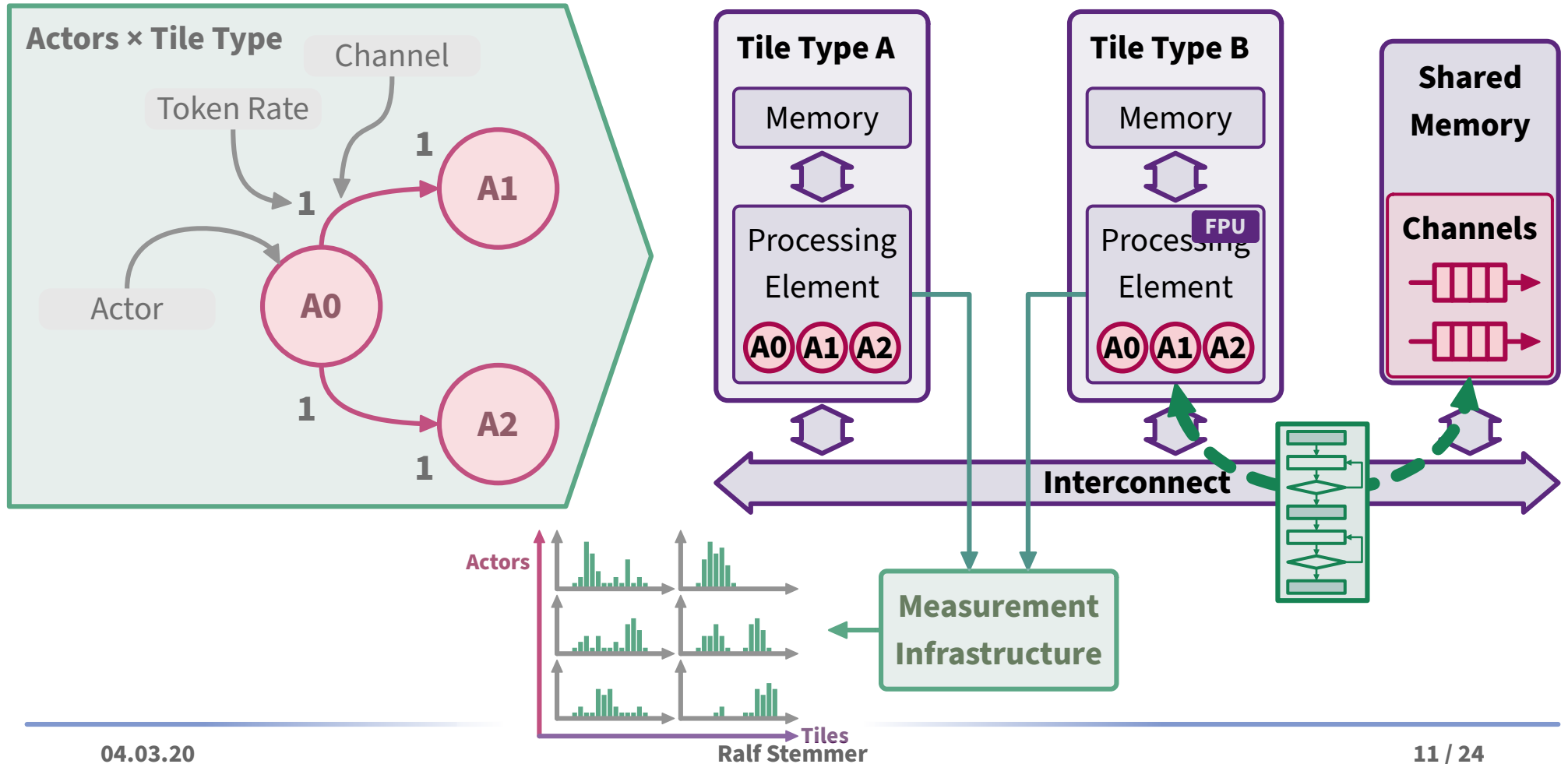
# Characterization



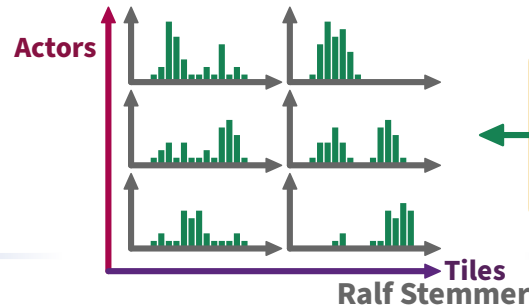
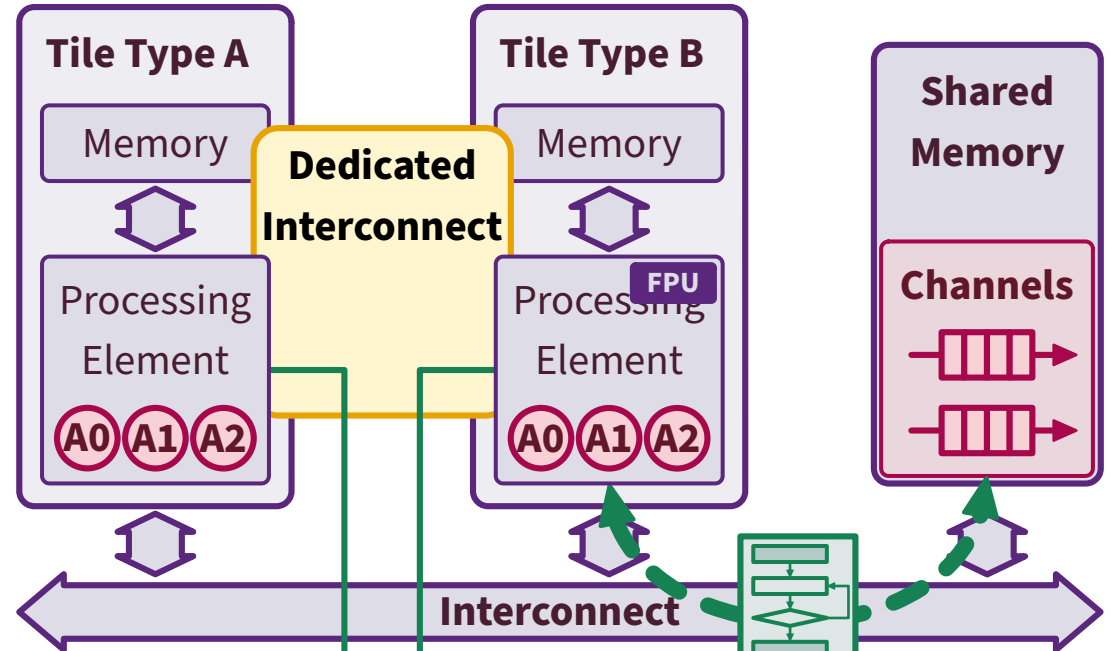
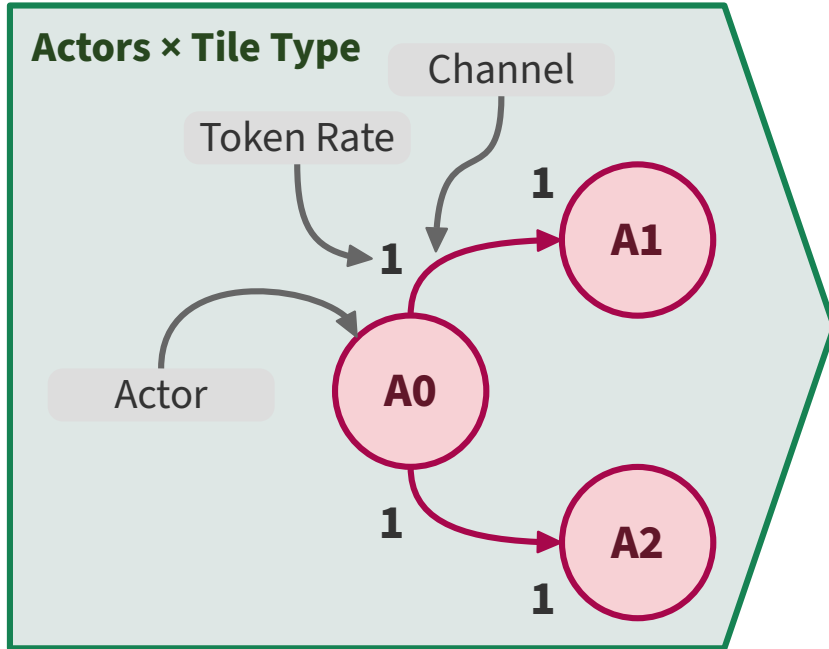
# Characterization: Computation

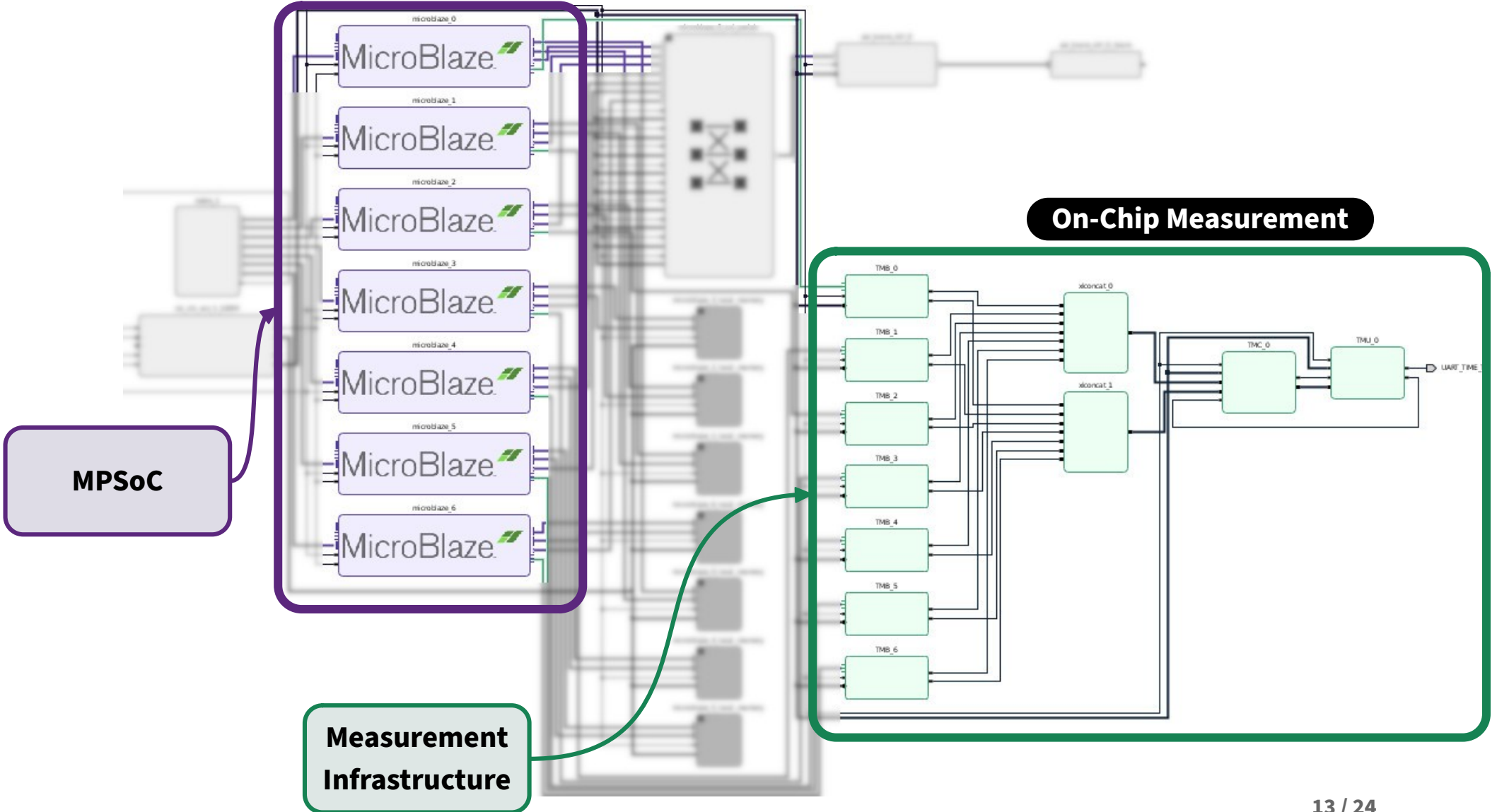


# Characterization: Communication



# Characterization: Constraints



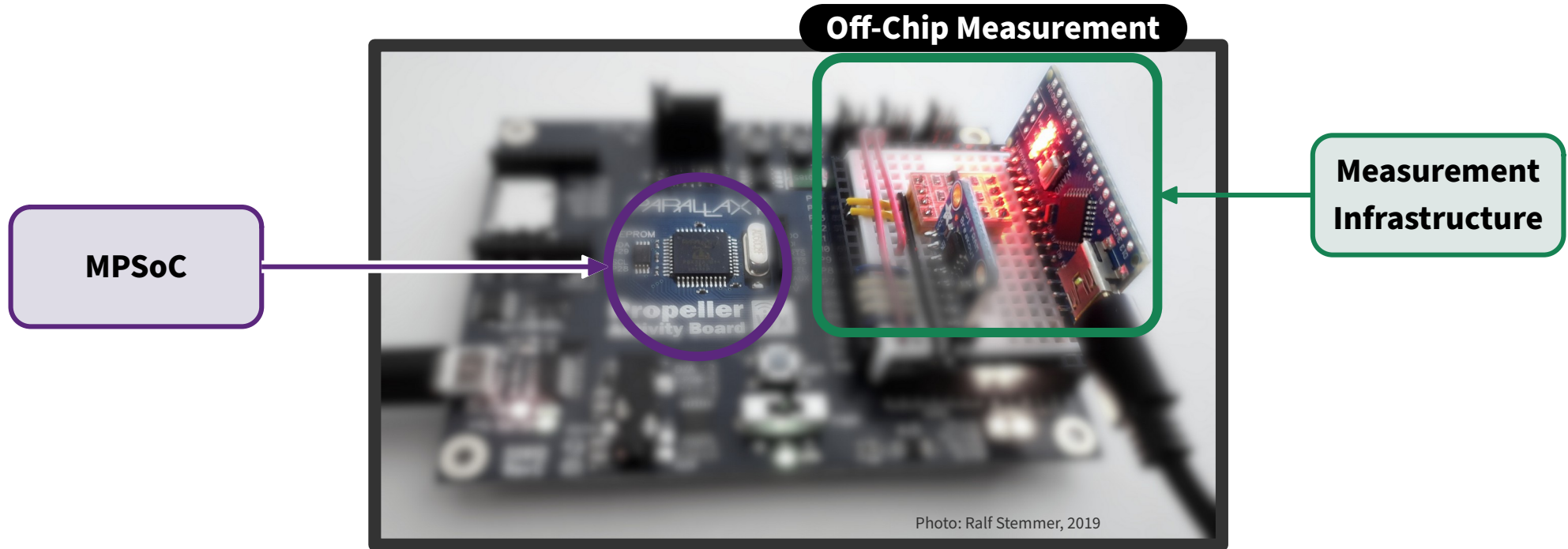


**MPSoC**

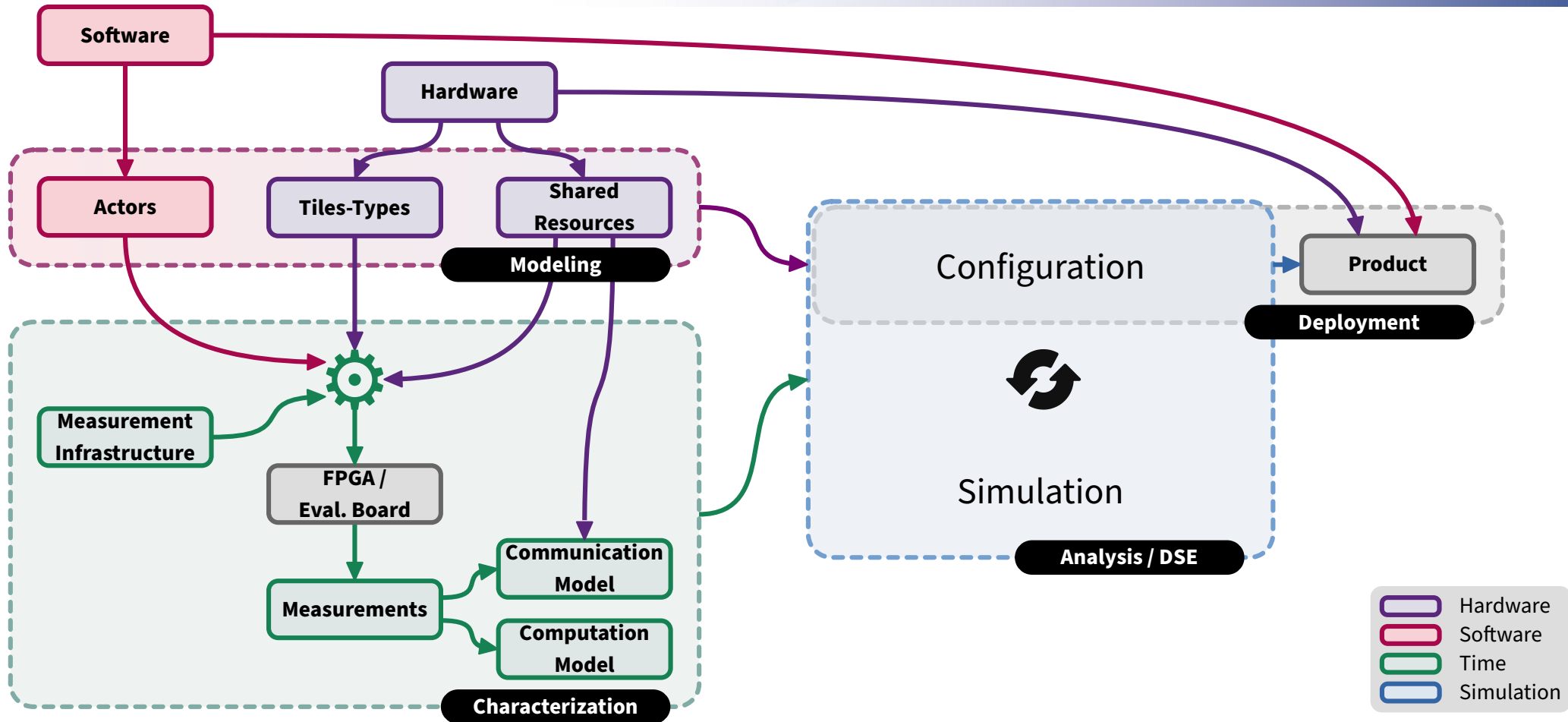
**Measurement Infrastructure**

**On-Chip Measurement**

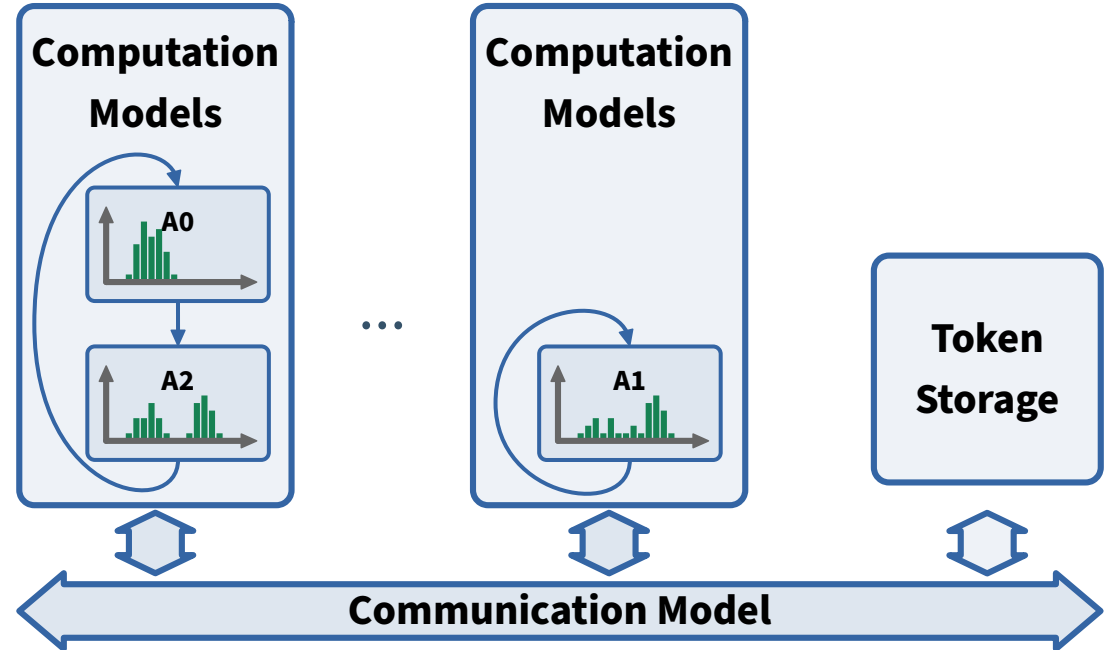
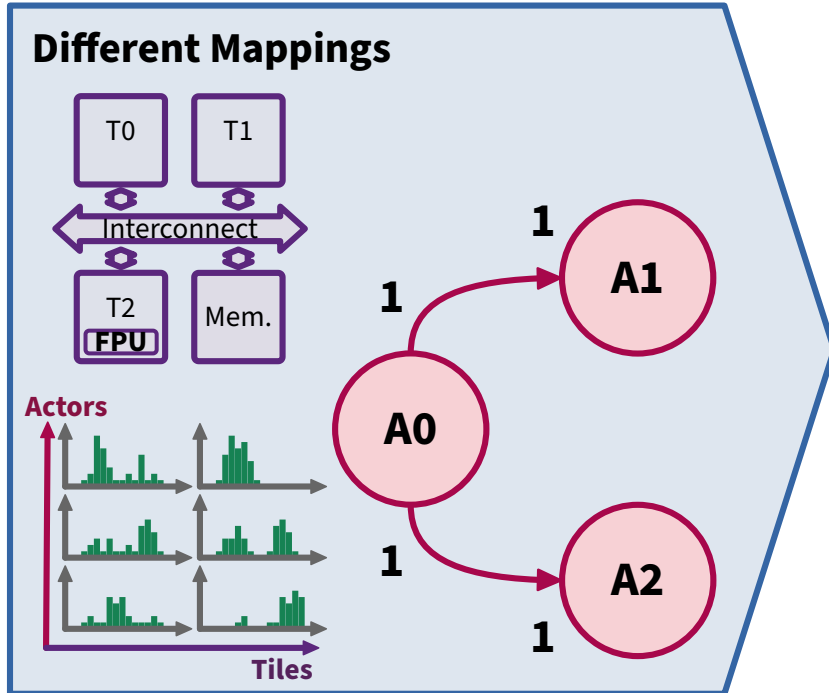
# Off-Chip Measurement



# Designflow: Characterization

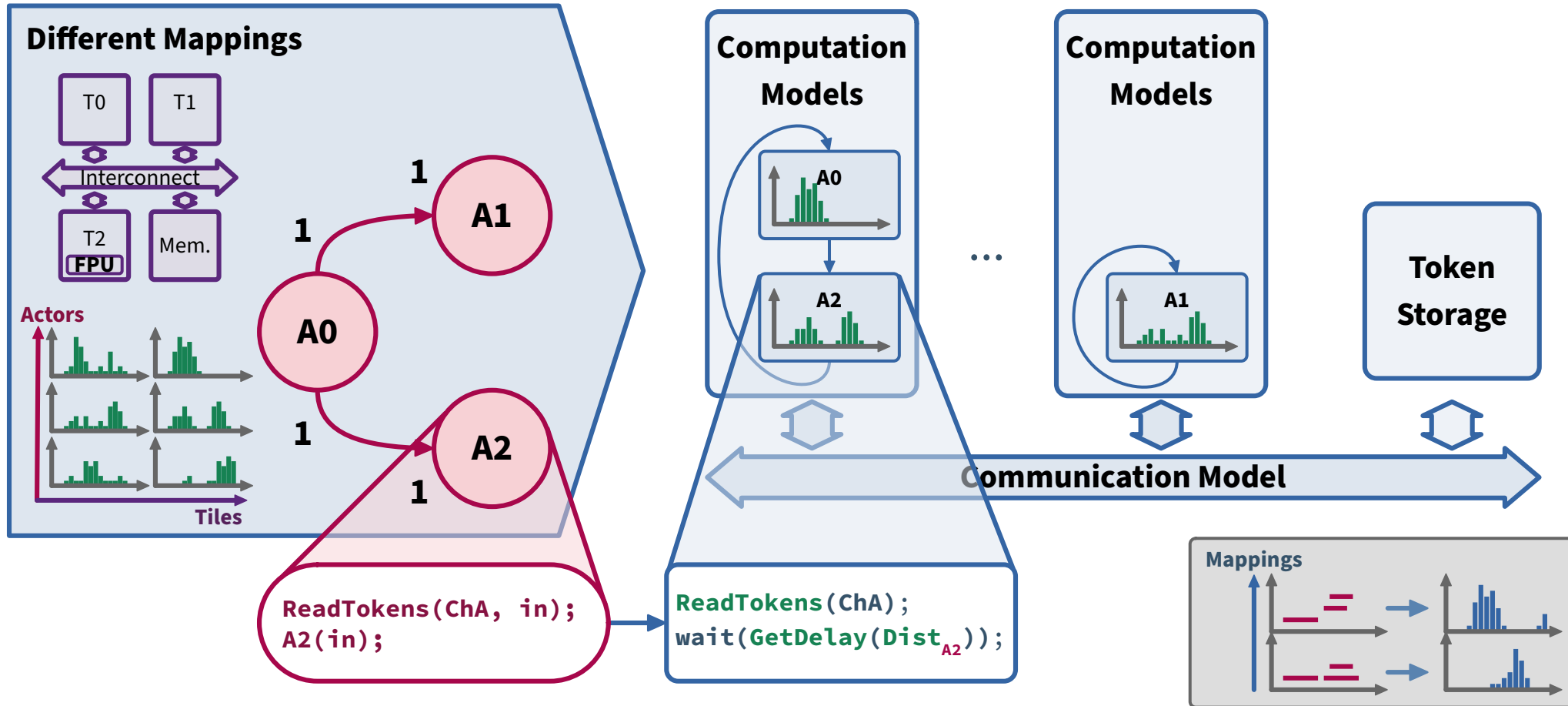


# Simulation

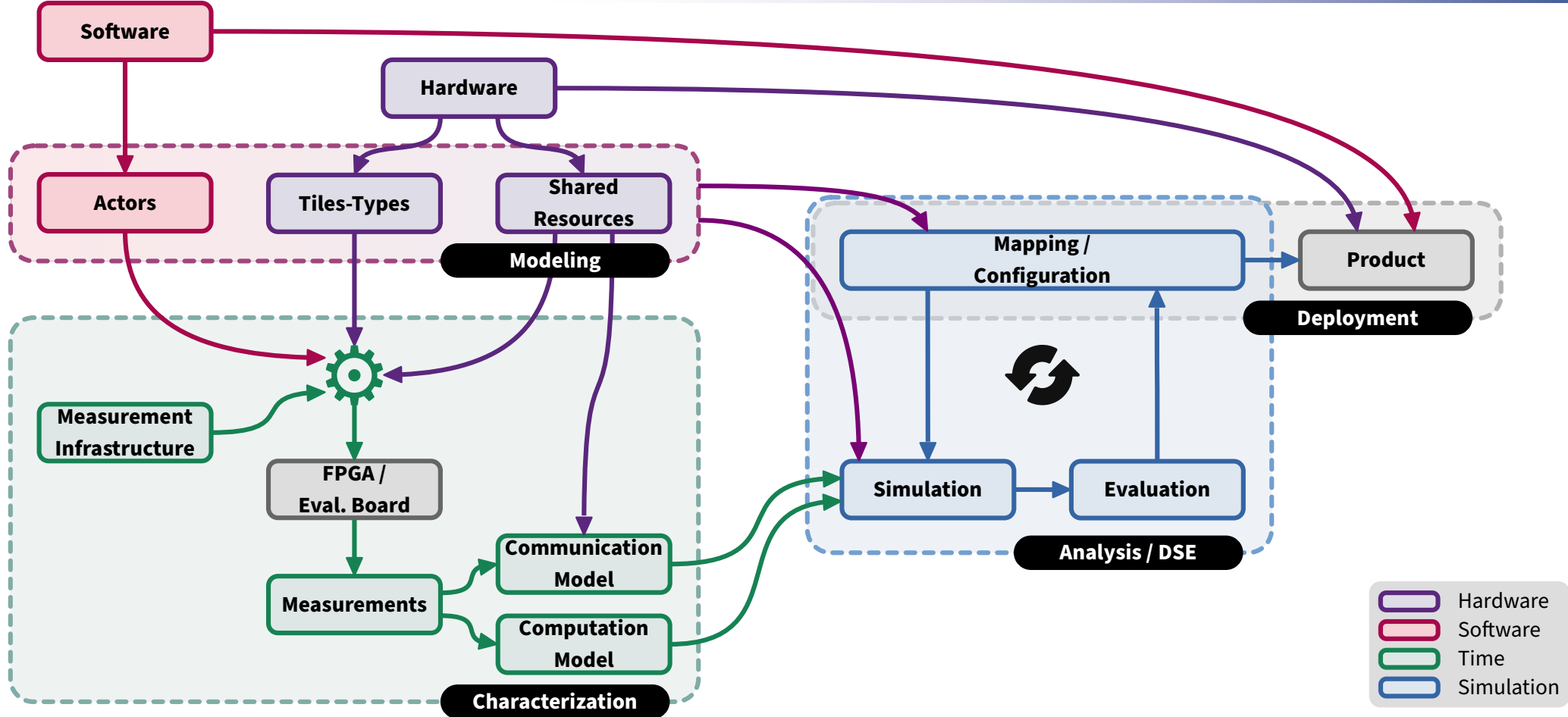




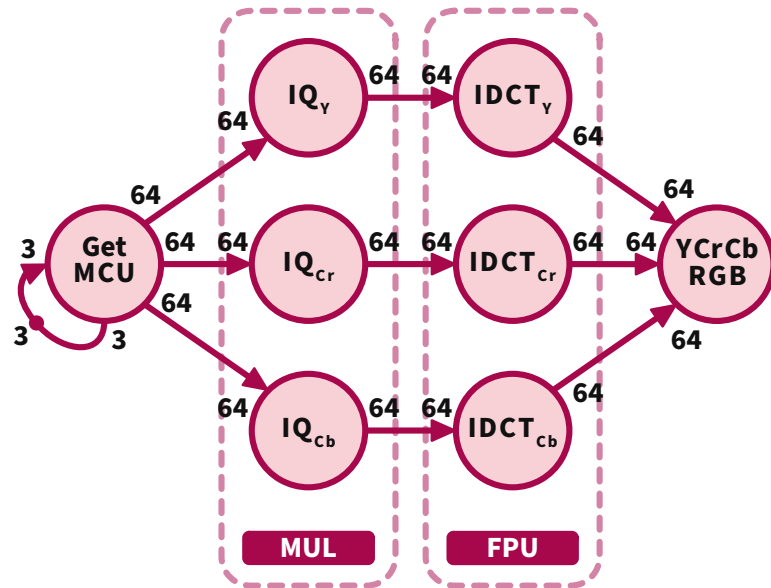
# Simulation: Details



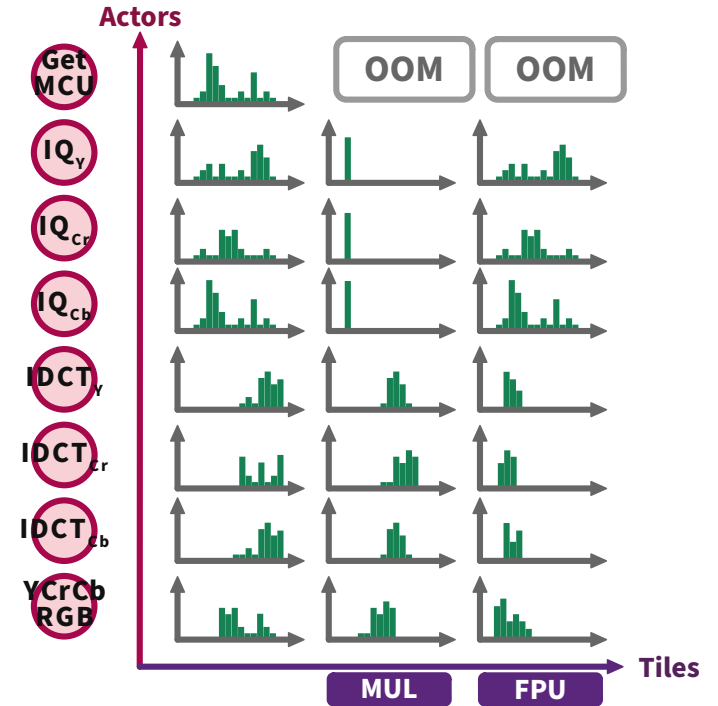
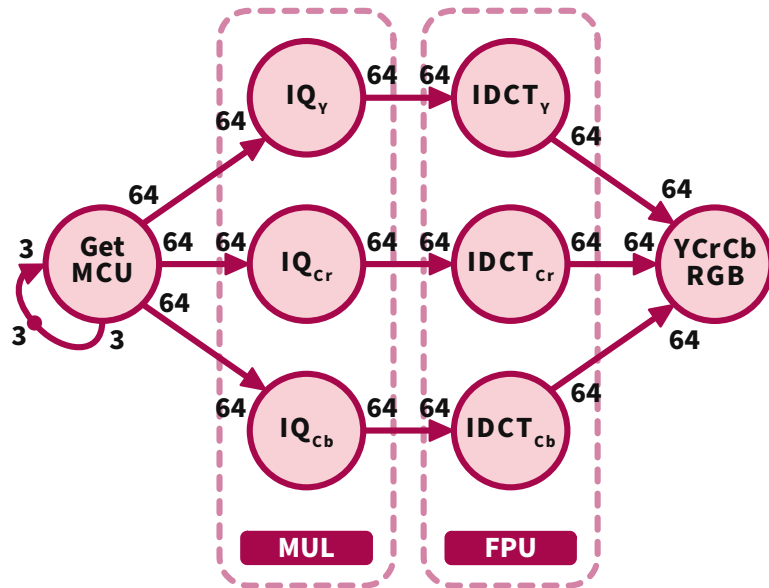
# Designflow

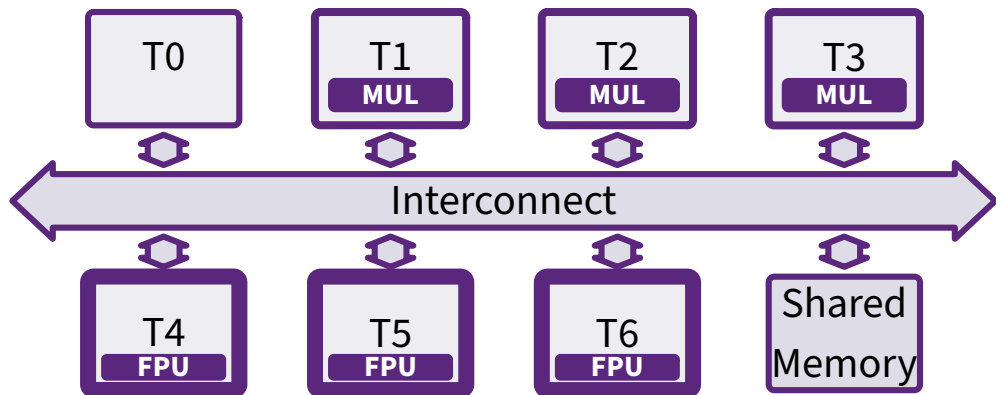
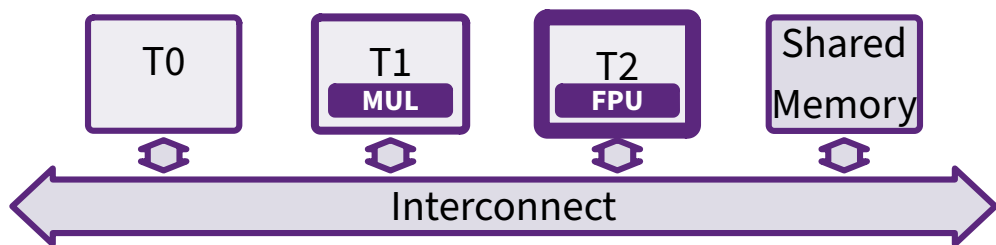
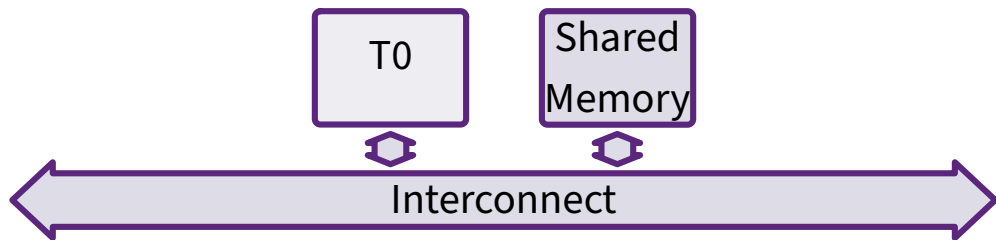


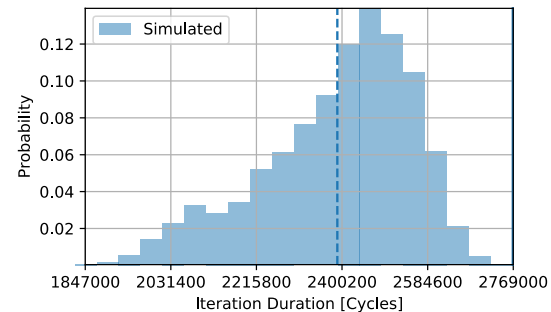
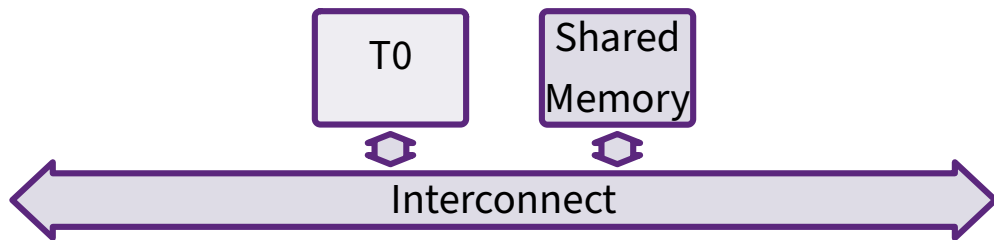
# Example: JPEG Decoder



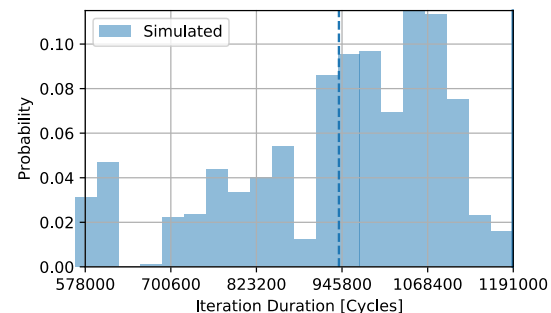
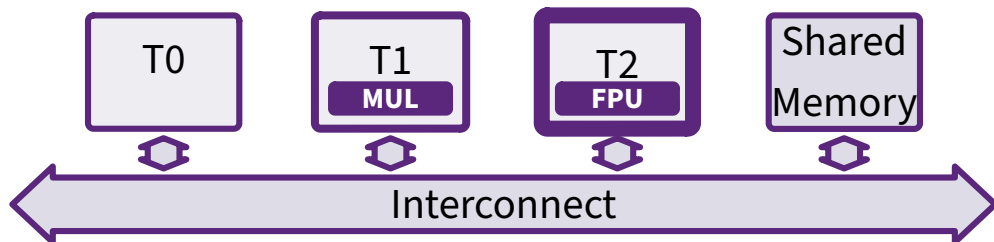
# JPEG Decoder: Characterized



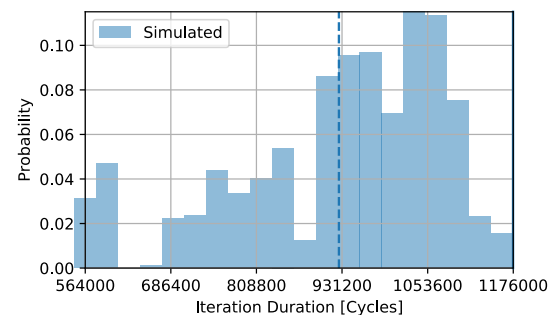
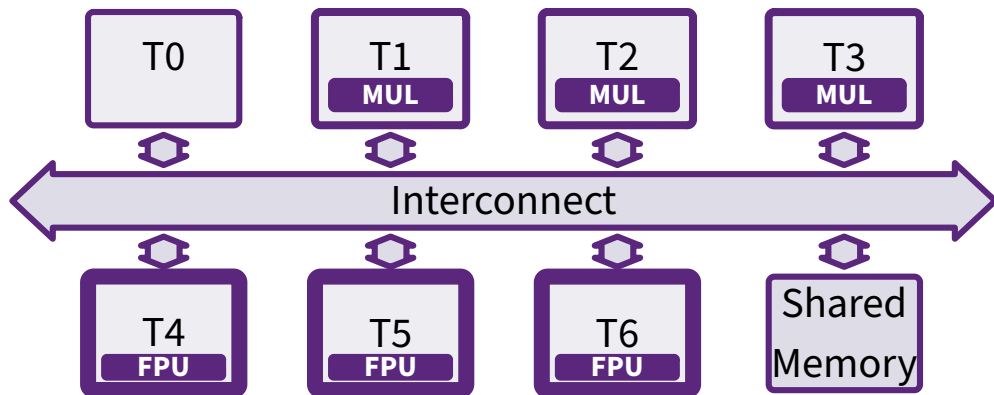




Avg:  $2.39 \cdot 10^6$   
 WCET:  $2.77 \cdot 10^6$

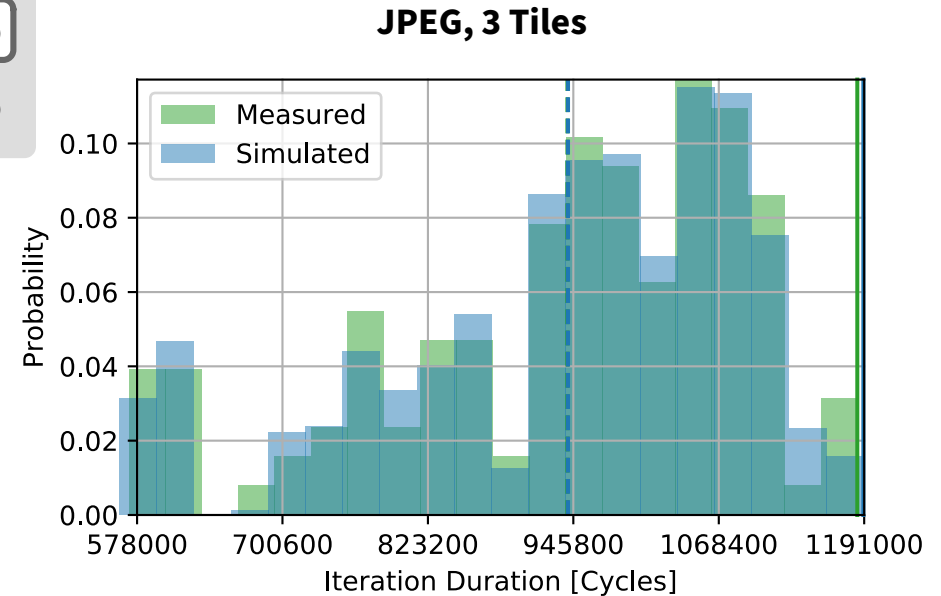


Avg:  $0.94 \cdot 10^6$   
 WCET:  $1.19 \cdot 10^6$

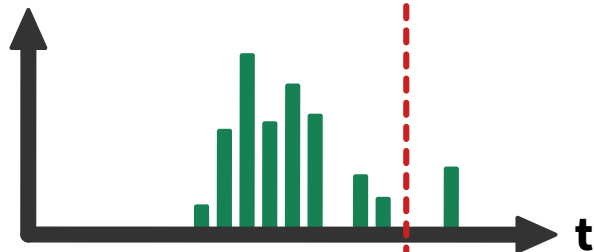
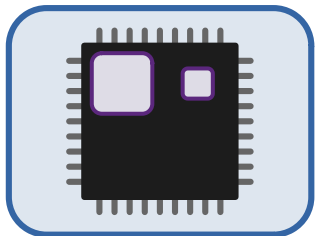
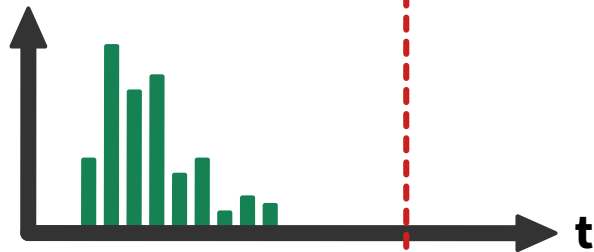
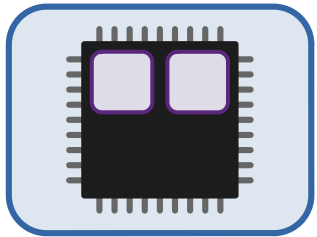
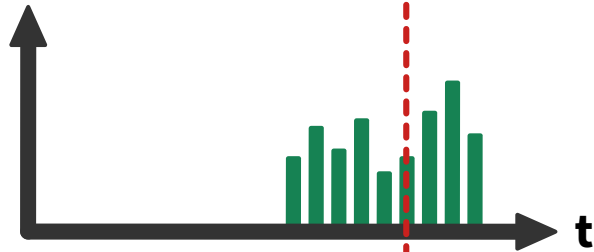
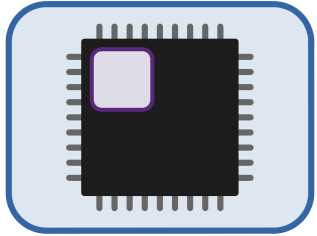


Avg:  $0.93 \cdot 10^6$   
 WCET:  $1.18 \cdot 10^6$

Experiment	Duration [HH:MM]		WCET Error	
	Simulation	Measurement	Simulation	Static Math.
JPEG, 1 Tile	< 1 min	13:15	0.17%	2.52%
JPEG, 3 Tile	0:39	5:13	0.05%	7.73%
JPEG, 7 Tile	1:47	5:13	-1.52%	7.31%



## Conclusion



- Tiles
- Caches
- Data Dependency
- + Characterization
- + Distribution
- + Accuracy vs. Speed
- + Easy Integration