



# FiPS

## **Using Field-Programmable Gate Arrays (FPGA) for Learning Non Player Characters**

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# What is a MMVE?

- large scale simulated 3D environment
- Challenge:
  - needs to be scalable
- Typical approach
  - distribute workload onto interconnected servers
  - E.g. cloud



# What is a MMVE

- Problem:
  - high workload in one area i.e. on one server instance
  - Density problem
  - Cannot be split up further
  - Worse: additionally high number of NPCs
- Idea:
  - Improve single server hardware
    - x86 server + FPGA

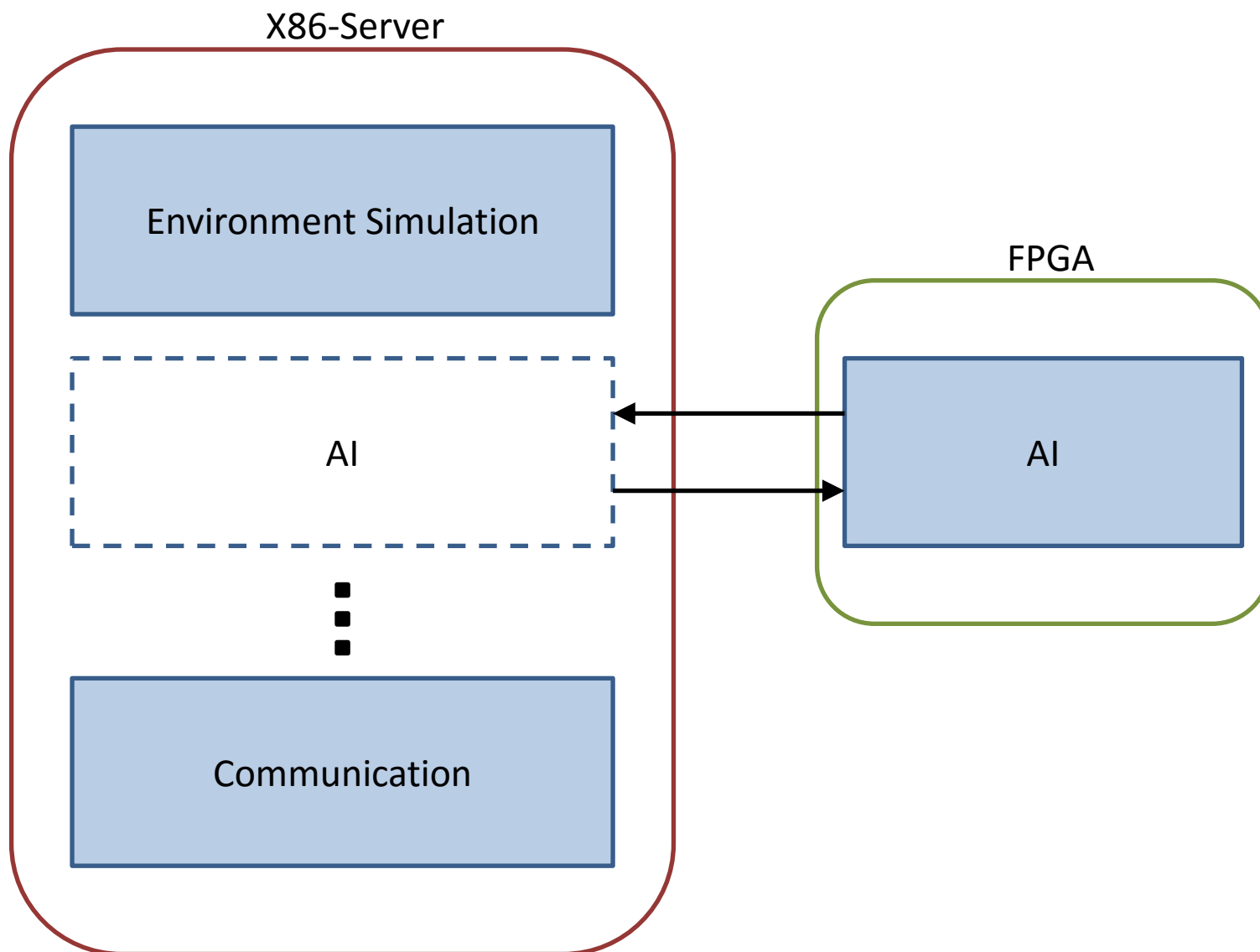


# What is a FPGA?

- Integrated circuit consisting of logic blocks
- Dynamically configurable wiring to create custom hardware
- Reconfigurable at any time
- Optimisable for specific application
- High parallelisation possible



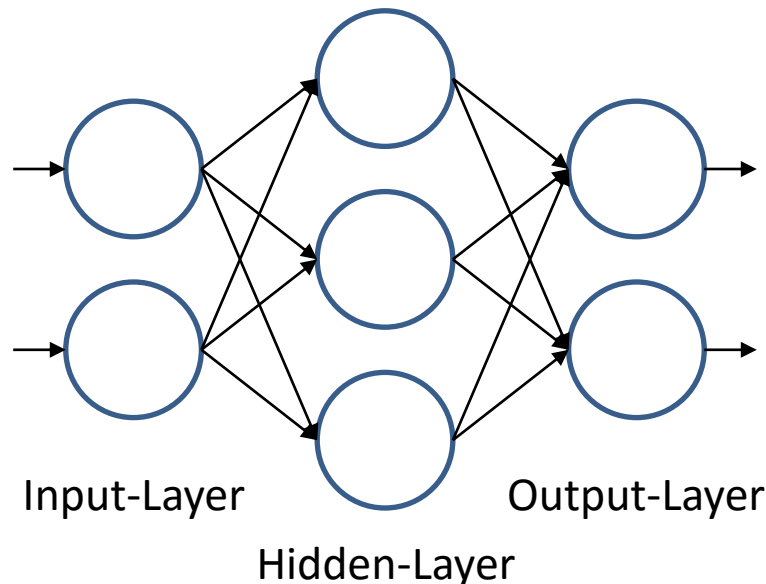
# MMVE on FPGAs





# Our goal

- Improve the AI with FPGA
  - Increase performance
  - More intelligent NPCs
  - Use reinforcement learning with artificial neural networks





# Preliminary Results

ANN size	CPU time (ns)	FPGA time* (ns)
ANN 5x5	103000	200
ANN 5x20	124000	800
ANN 20x50	211000	(2000)

Comparison of execution time of different ANNs on an Intel Core i7-4710MQ and a Xilinx Zynq XC7Z045 FPGA \*(simulated values) in seconds



# Preliminary Results

ANN size	FPGA time (ns)
9x5	71.6
9x20	219

Execution time of ANNs run on a Xilinx Zynq XC7Z030 FPGA in nanoseconds



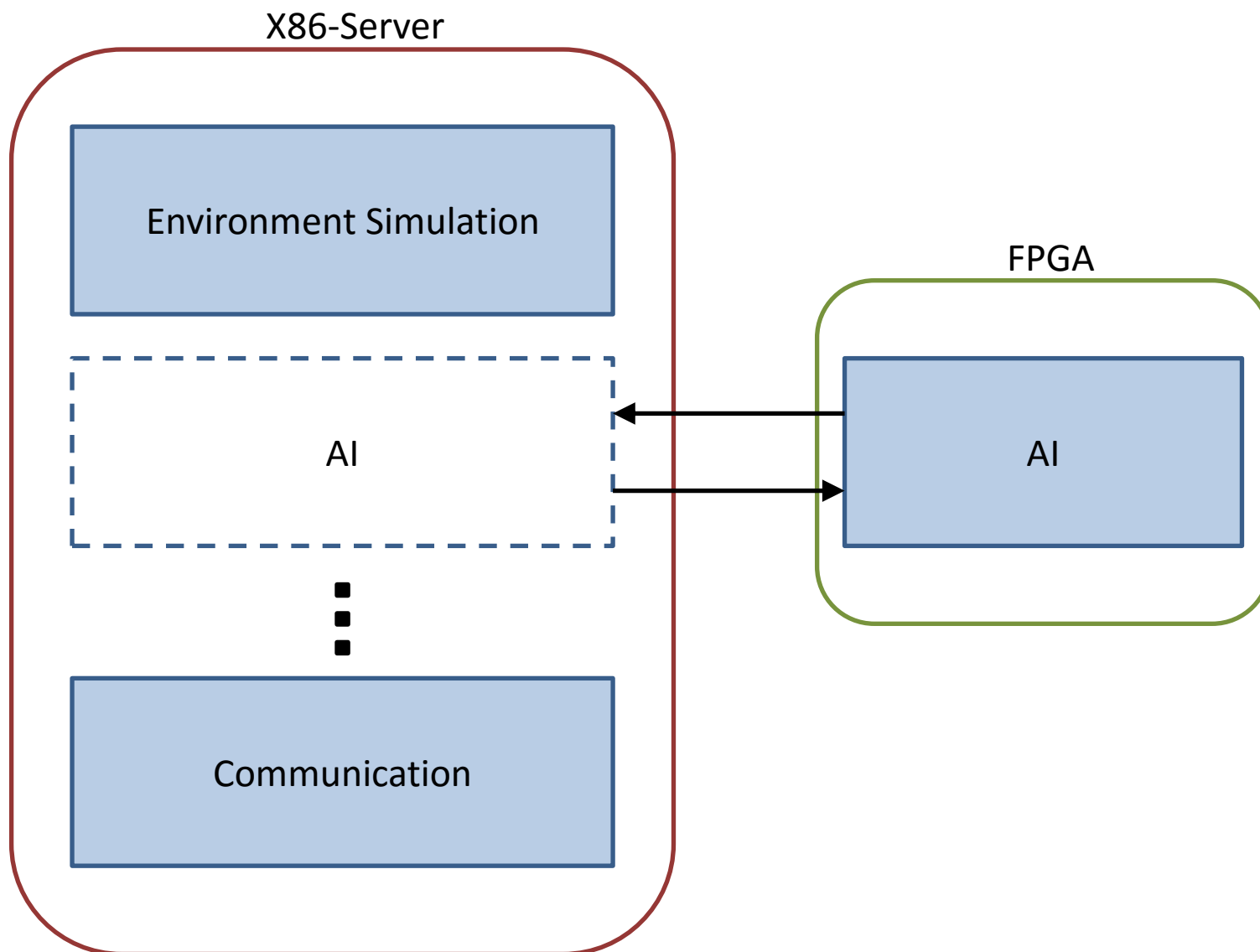


# Conclusion

- FPGA as new hardware platform
  - How else can it be used?
  - Fundamental change?
- AI being deployed on FPGA
  - Results are promising
  - Work in progress
- But:
  - not using FPGA runtime reconfiguration features yet

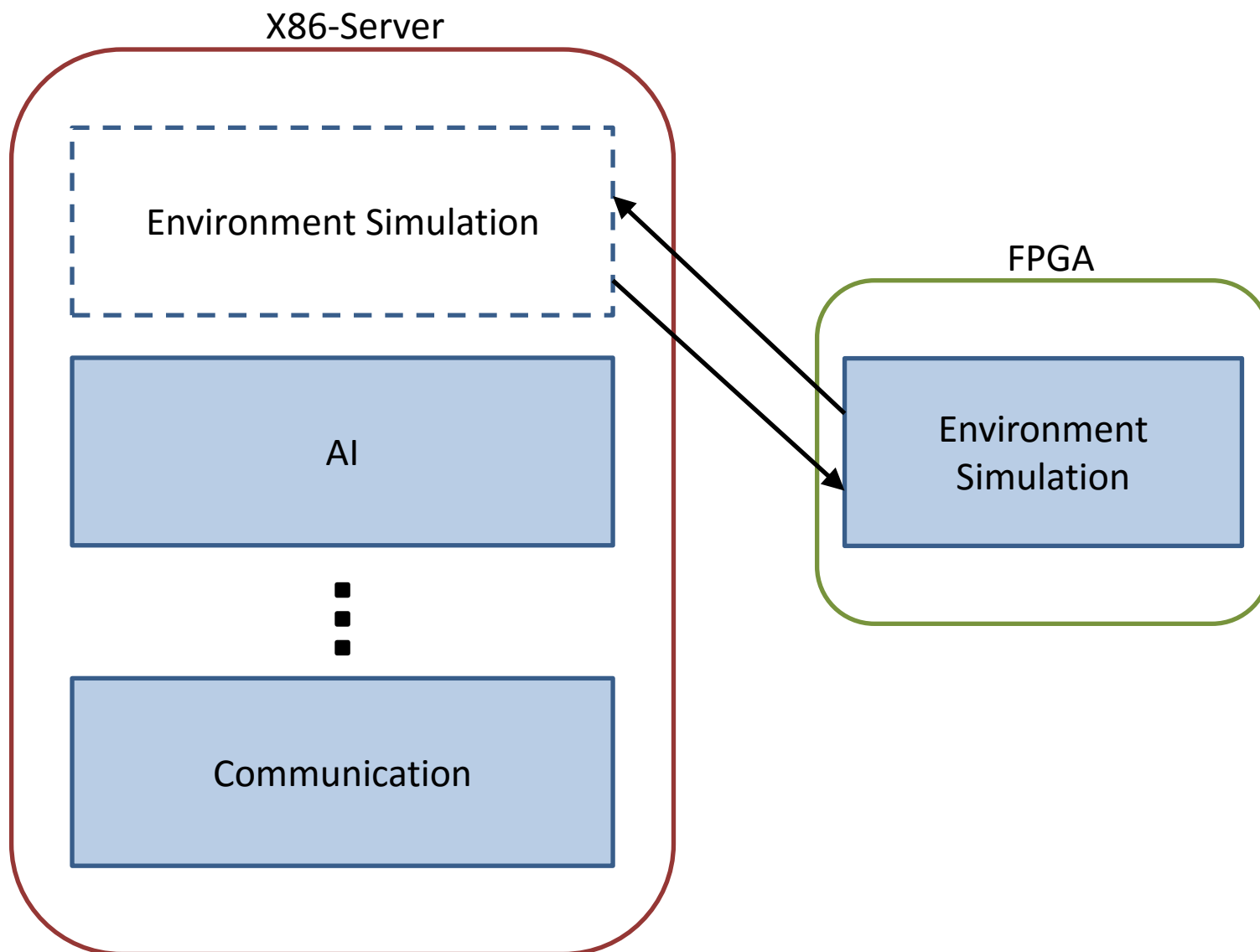


# Future Work





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