### EMBRACE Hardware SNN Architecture Features

- Designed using SystemC simulation based systematic design exploration
- Compact and scalable modular neural tile design
- Low distortion hierarchical NoC architecture for reliable SNN applications
- Modular robotic navigation controller application demonstrated on EMBRACE-FPGA prototype (comprising 448 neuron and 32K synapses on Xilinx Virtex-6 XC6VLX240T FPGA)

### EMBRACE-SysC Design Exploration Framework

- Two layered 16:16 Fully Connected SNN Structure as the Neural Computing Module and the NoC Module
- Modular application prototyping technique offers:
  - Eliminates SNN information distortion due to NoC spike latency jitter
  - Novel timestamped broadcast flow control offering high density localised spike transfer
  - Faster application evolution
  - Simplified SNN training
- Accurate application behaviour for various NoC traffic conditions

### EMBRACE Hierarchical NoC Architecture

- Fixed latency on-chip interconnect for hardware spiking neural network architectures
- Novel hierarchical NoC architecture for reliable SNN applications
- Reduces the SNN topology memory requirement of NoC-based hardware SNNs by using a compact and scalable modular neural tile architecture for mesh topology NoC based hardware SNN

### Modular Robotic Navigational Controller Application

- Complex multifunctional robotic navigational controller application decomposed into:
  1. Obstacle avoidance controller subtask controls the robot movement for avoiding obstacles
  2. Speed and direction manager subtask steers the robot towards target location
  3. Application prototyping based on sensory inputs and functionality
- Modular application prototyping technique offers:
  - Simplified SNN training
  - Faster application evolution
  - Accurate application behaviour
  - Steepe knowledge integration

### References

1. Sandeep Pande. et al., Fixed latency on-chip interconnect for hardware spiking neural network architectures, International Symposium on System on Chip (SoC), Sept. 2013, Singapore (Accepted)