

Humanoid Robot Dexterous Hand Solution



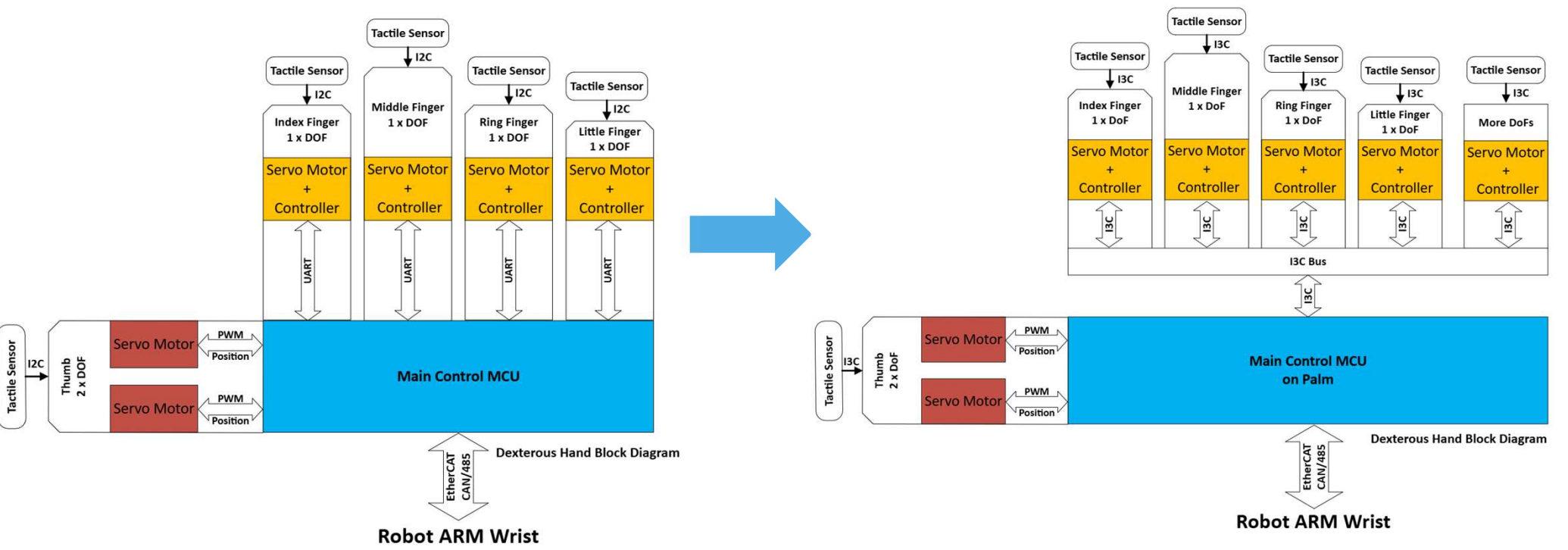
SECURE CONNECTIONS
FOR A SMARTER WORLD

CONFIDENTIAL

NXP, THE NXP LOGO AND NXP SECURE CONNECTIONS FOR A SMARTER WORLD ARE TRADEMARKS OF NXP B.V.
ALL OTHER PRODUCT OR SERVICE NAMES ARE THE PROPERTY OF THEIR RESPECTIVE OWNERS. © 2021 NXP B.V.



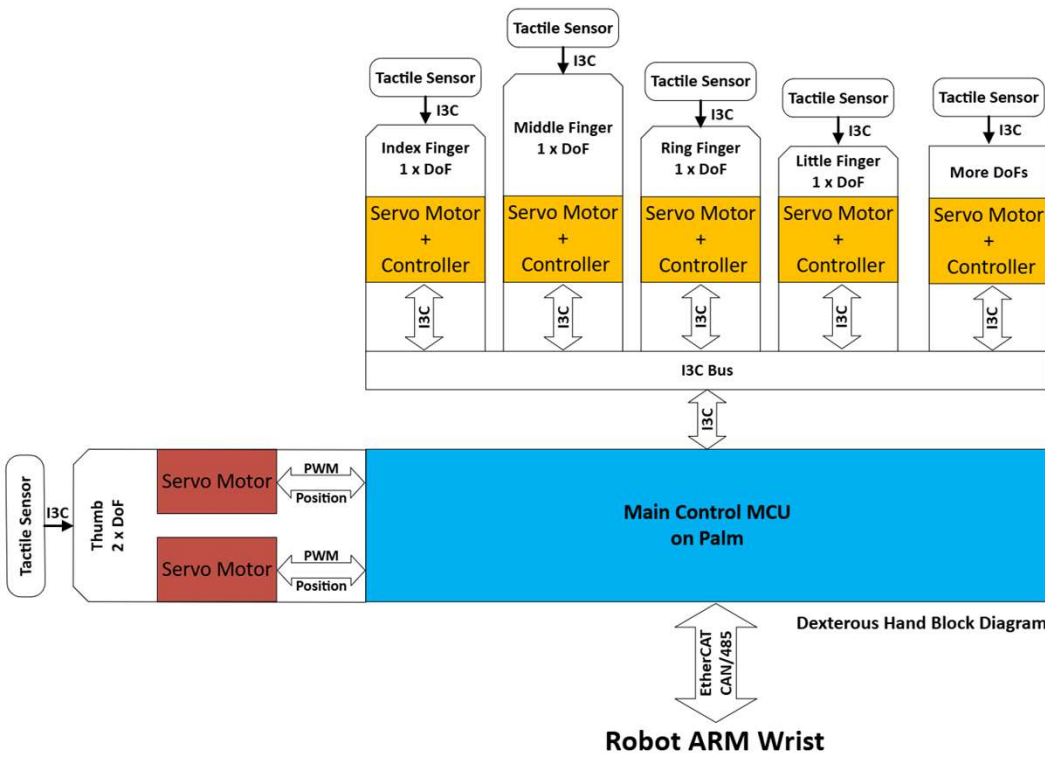
Proposal I3C Bus Topology



I3C-2-Ethercat Bus Topology for Dexterous Hand System in Humanoid Robot

➤ Highlight advantage of this new bus topology

- ✓ The block diagram is the new topology of active 6 DoF(Degree of Freedom) dexterous hand, but more DoF are also easily extended with flexibility on this topology;
- ✓ Main Control MCU can unify the bus interface to I3C bus to connect servo motor controllers and tactile sensors together with minimum cables for communication without external PHY required to save the cost and to decrease wiring space across the whole hand;
- ✓ I3C bus supports max.12.5Mbps speed with push-pull drive, much higher than UART and CAN2.0;
- ✓ I3C topology is a sync communication, no need external precise oscillator like UART or CAN async interface. Save BOM cost and PCB space;
- ✓ The I3C is a bus topology, one master can connect up to 11 devices through only 2 wires without transceiver PHY.
- ✓ The new topology of I3C supports hot-join to make DoF finger in Dexterous Hand assembly or replacement with electricity;
- ✓ The new topology supports master/device role dynamic transition to support communication between devices each other;
- ✓ It supports In-Band Interrupt to support asynchronous urgent or fault event trigger from a device to master by only using the SDA and SCL two lines' timing;
- ✓ This new topology implements a data transmission flow from I3C local bus in Dexterous hand to EtherCAT humanoid robot body system bus;



Proposed NXP Products Portfolio:

Main Control MCU: MIMXRT1186, 10*10mm, 300MHz M33/600MHz M7, 2*Ports ECAT or Switch, 1MB SRAM, 8*UART, 1*CANFD, 16*PWM, 4*QDC and 2*I3C;

Servo Node MCU: MCXA132VFM, 5*5mm, 96MHz M33, 64KB Flash, 1*I3C, 3*UART, 6*PWM and 1*QDC, and further support IEC61508 industry function safety SIL2 library.

1st Version HW Prototype



CONFIDENTIAL

3