Optimizing the Efficiency of the Transfer Mechanism in SCA-based Radio Systems

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Outline

- Problem of CORBA （Linux-kernel-based）
- Analysis of Causes
- Optimization Proposal
- Adoption and Proven

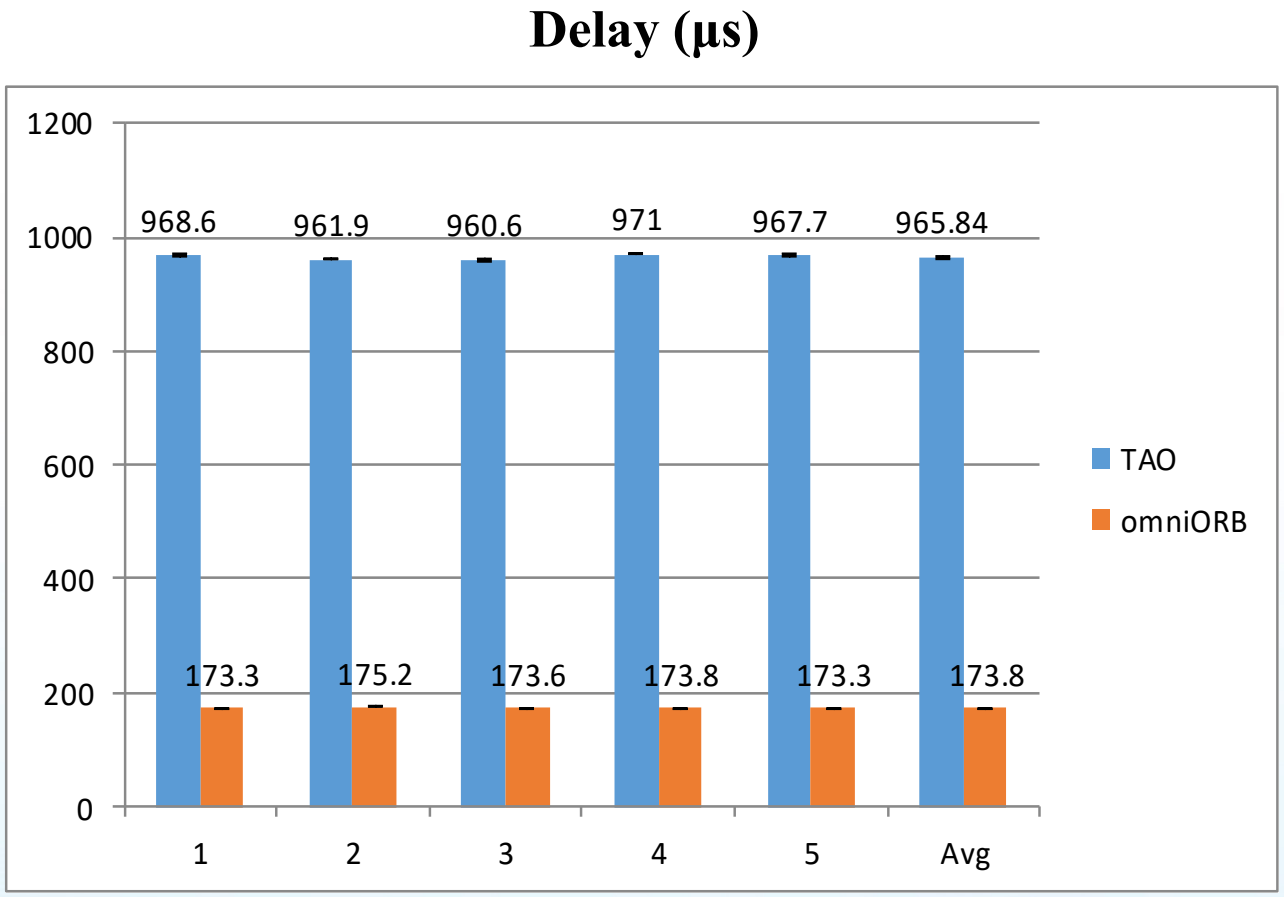
Some Premises

- In SCA 4.1 specifications, the transfer mechanism becomes more flexible and diversified.
- As a classical transfer mechanism, CORBA has been widely used in SCA-based software radio systems.
- Communication between components can be classified by their locations : inter-chip and intra-chip, we call them remote-call and local-call separately.

Problem of CORBA

Application Environment

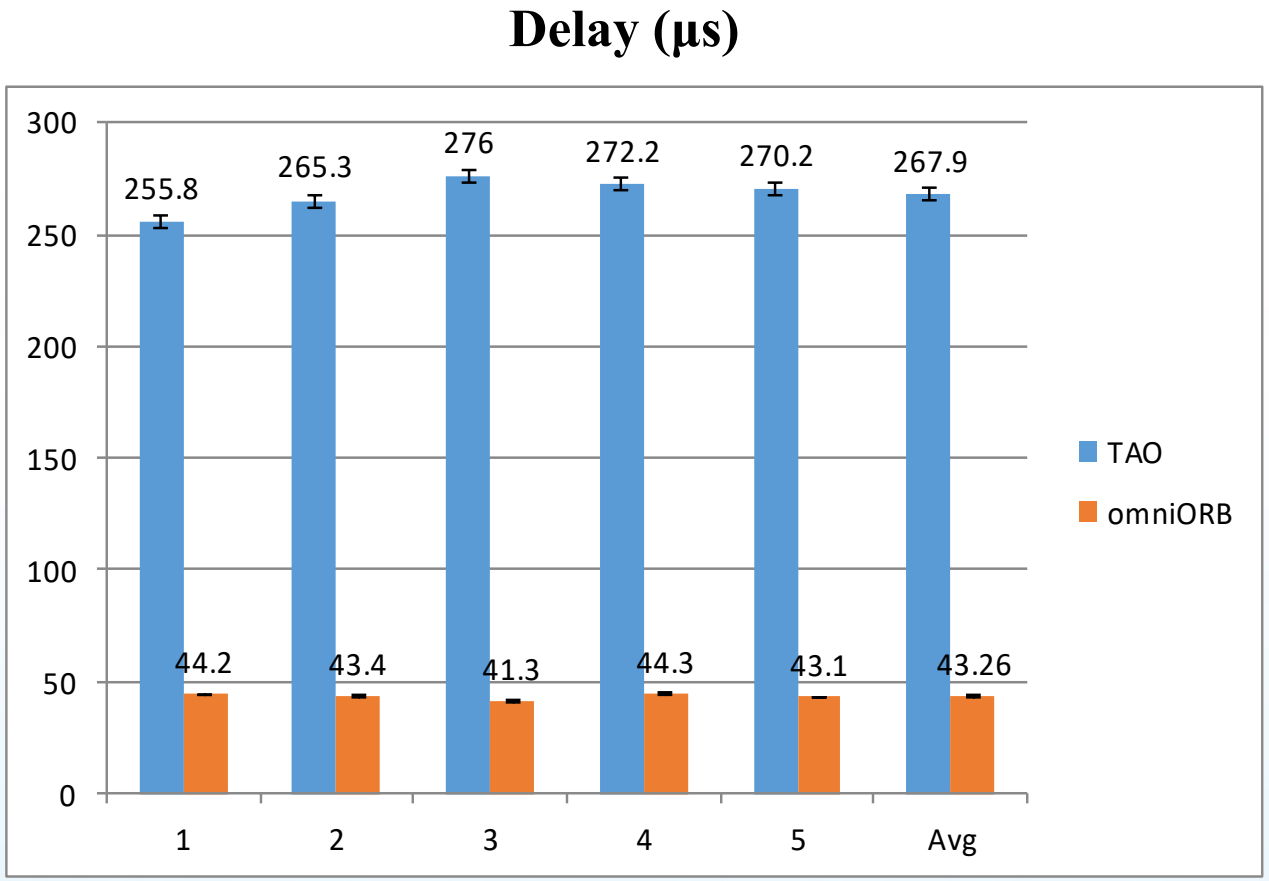
- ARM Cortex-A7（Zynq70xx）
- Linux-3.17
- 1GB RAM
- CF-SCA4.1
- TAO & omniORB



Problem of CORBA

Application Environment

- Intel i7-6700
- Linux Ubuntu14.02
- 4GB RAM
- CF-SCA4.1
- TAO & omniORB



Results show that the efficiency of the ORB-based middleware, such as TAO and omniORB, has become one of the challenges that constrain SCA to be further widely applied.

Why?

In many Linux based applications, Core Framework starts all components in process mode, including device/service components, and waveform components.

- The advantage is that it loosens the difference of program languages and can work in distributed networks.
- However, the disadvantage is also obvious, especially in what we call the intra-chip application environment.

Local-call Characteristics

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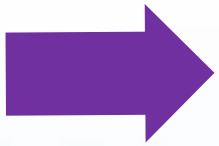
Thread Mode



How to integrate process mode with thread mode flexibly.

Domain Manager

Device Manager

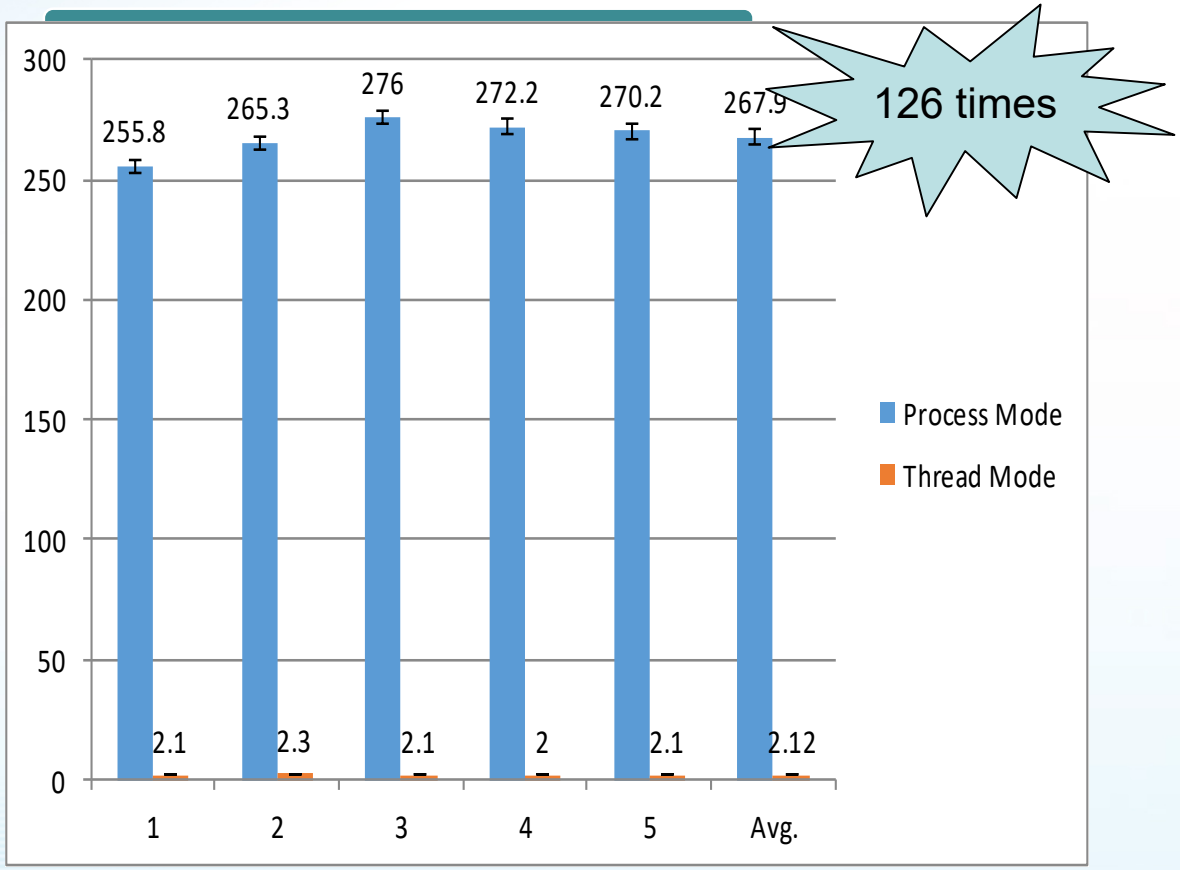
Device

GPP Device, FPGA Device, DSP Device, Ethernet Device, Serial Device, Platform Service, etc.

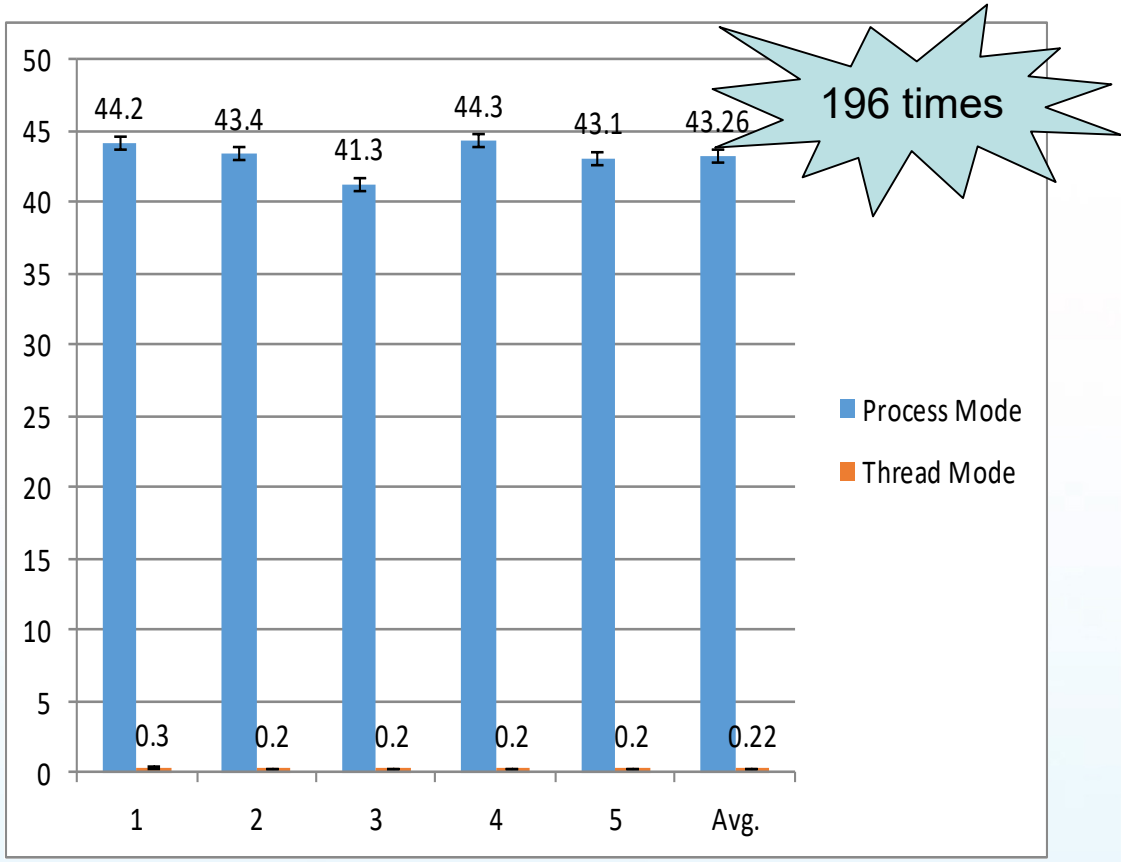
Application

NET Component, LLC Component, Security Component, etc.

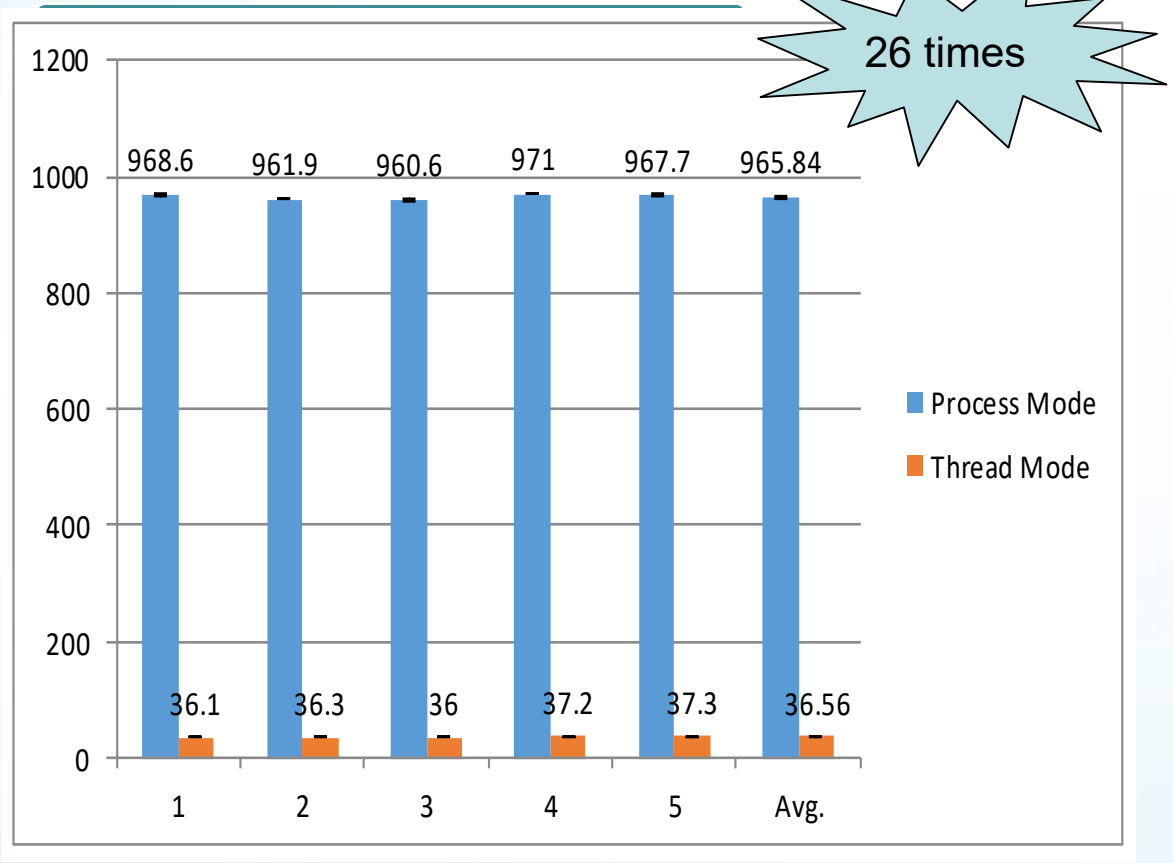
TAO's Delay (μs)



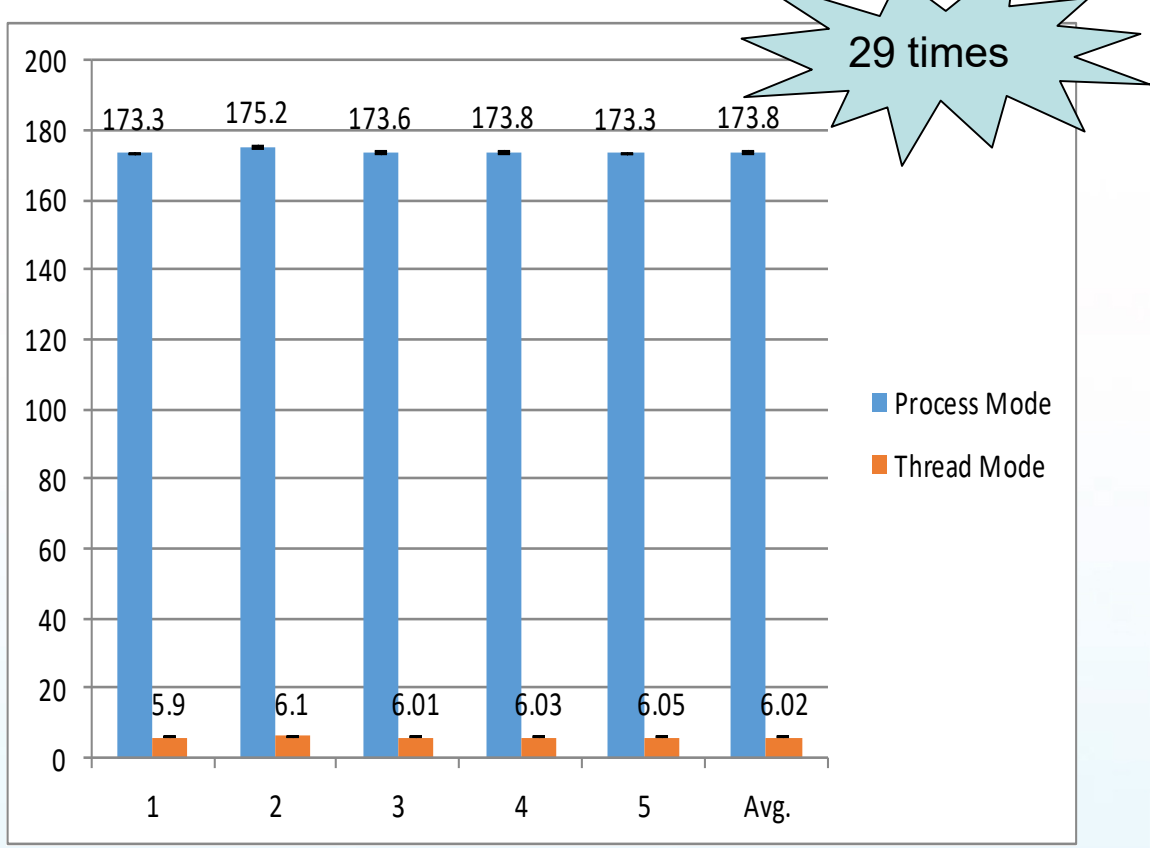
omniORB's Delay (μs)



TAO's Delay (μs)



omniORB's Delay (μs)



◆ Process Mode

This mode is suitable for waveform resource deployment based on multi-channel equipment or control interactions among different nodes.

◆ Thread Mode

Components must run in the same program space. So, it is suitable for small size SoC system or waveform applications located in the same processor.

Thank you.

Any question?