Motion Solutions by INtime®/EtherCAT®/Techno

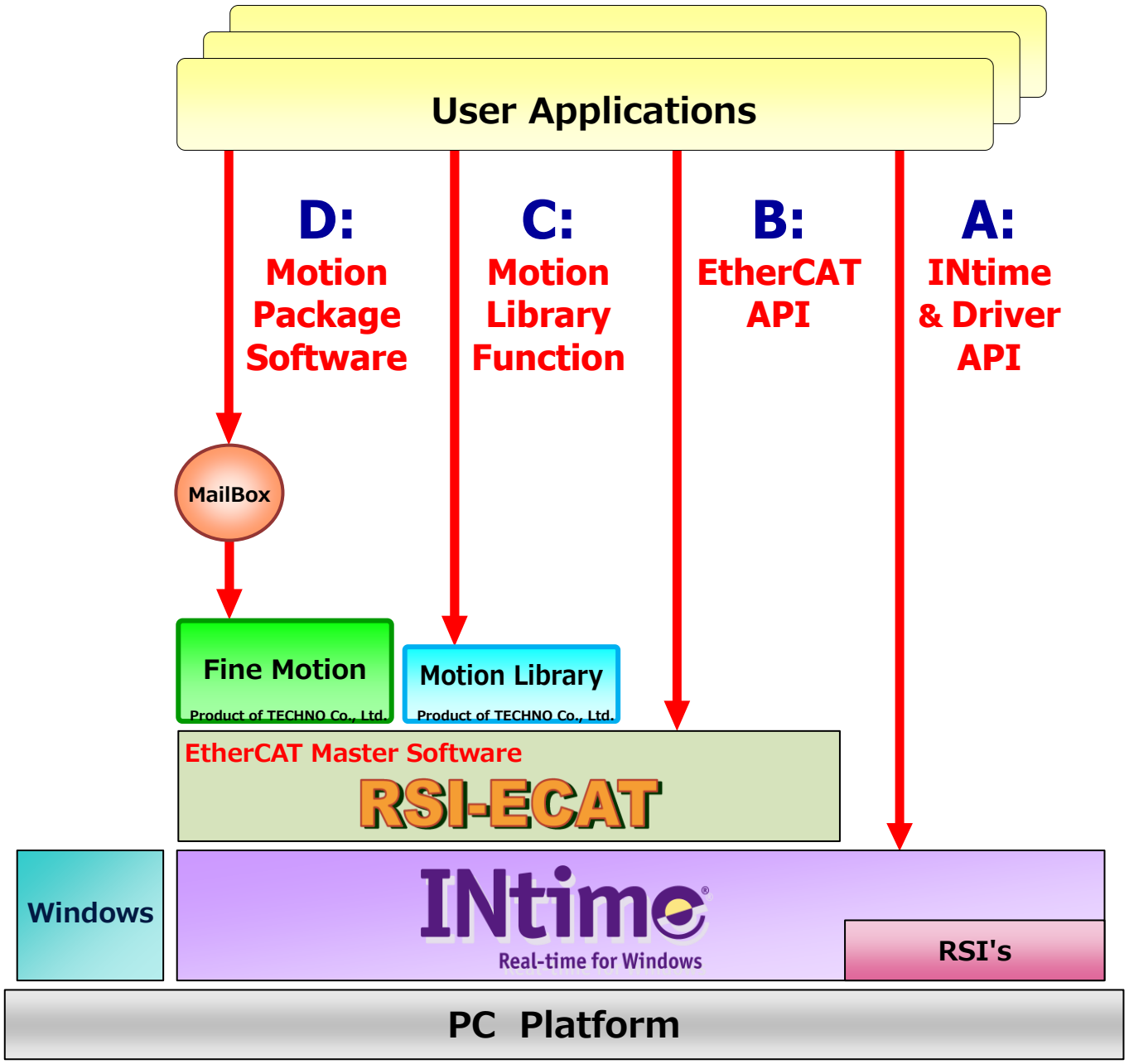

Figure 1 : Motion Solution by INtime®/EtherCAT®/Techno

A : INtime® & Driver API

INtime is a real time OS which provides real-time performance / reliability so that PC can be used for industrial controls.
It can run coexistent with Window®. You can develop real time applications using Microsoft® Visual Studio. APIs for real time applications (※Table 2) and Drivers (※Table 3) already have been prepared.

Table 1 : INtime® Specifications

Priority Scheduling	256 levels
Kernel Tick	50us, 100us, 125us, 200us, 250us, 500us, 1ms, 2ms, 5ms, 10ms
Mailbox	FIFO Method/ Priority Method
Semaphore	FIFO Method/ Priority Method
Maximum Segment Size	4GB in system total
Interrupt	Handler / Thread Architecture, IRQ / MSI Available
Development Language	C/C++
Standard I/O	TCP/IP, TCP/IP, USB, RS232C
Maximum Object Quantity	8190 (including system)

Table 2 : INtime® API (excerpt)

Interrupt Management
SignalEndofRtInter, SetRtInterruptHandler, ResetRtInterruptHandler, SignalRtInterruptThread, WaitForRtInterrupt, DisableRtInterrupt, EnableRtInterrupt
Mailbox Management
CreateRtMailbox, DeleteRtMailbox, SendRtHandle, ReceiveRtHandle, SendRtData, ReceiveRtData
Memory Management
AllocateRtMemory, FreeRtMemory, CreateRtMemoryHandle, DeleteRtMemoryHandle, MapRtShareMemory, MapRtPhysicalMemory, GetRtPhysicalAddress, GetRtSize
Object Management
CatalogRtHandle, LookupRtHandle, UncatalogRtHandle, GetRtHandleType, GetRtHandletypeEx, InspectRtProcessDirectory
Process Management
CreateRtProcess, ExitRtProcess, RtNotifyEvent, RegisterRtDependency, UnregisterRtDependency, RegisterRtSponsor, UnregisterRtSponsor
Scheduler Management
knRtSleep, knStartRtScheduler, knStopRtScheduler
Semaphore Management
CreateRtSemaphore, DeleteRtSemaphore, WaitForReSemaphore, ReleaseRtSemaphore
Status Management
GetLastRtError, SetLastRtError, CopyRtSystemInfo, ReportRtEvent
Thread Management
CreateRtThread, DeleteRtThread, RtSleep, GetRtThreadPriority, GetRtThreadHandles, SetRtThreadPriotity, SetRtProcessMaxPriority, GetRtThreadAccounting, SuspendRtThread, ResumeRtThread, GetRtThreadInfo
System Data Management
ntxGetLocationByName, ntxGetFirstLocation, ntxGetNextLocation, ntxGetNameOfLocation

Table 3 : INtime® Drivers Product

Serial Communication Bus
RSI-001, RSI-008, RSI-016, RSI-006, Starndard Serial Control Driver
Digital Communication Bus
RSI-002, Starndard USB Driver
A/D Conversion Board
AD12-16U(PCI)EH, AD16-16(LPCI)L Library
Image Recongniton
AWP-332-04, AUP-SEARCH, AZP-7101-02
Motion Control
RSI-612, RSI-534, RSI-578, RSI-5212, RSI-708, RSI-SMC4DF, RSI-SMC8DF, RSI-SMC4DL, RSI-SMC8DL
Real time network (FL-net)
RSI-040
Fieldbus
RSI-CCL, RSI-CCIE, RSI-060

B : EtherCAT Master Software「RSI-ECAT」

We have RSI-ECAT-Master as an EtherCAT master software for INtime®. RSI-ECAT-Master has the functions described in Table 4. RSI-ECAT-Master can do basic I/O control such as Analog I/O and can do controls such as basic servo motors using API described in Table 5.

Table 4 : RSI -ECAT Master Funciton Specifications

Function	RSI-ECAT-Master		
	-	DC	RED
Basic spec			
Protocol	IEC61158-2/3/4/5/6-12		
Max Slaves	65,535		
Baudrate	100Mbps		
Data transport layer	100BASE-TX		
Duplex	Full		
Max cable length slave-slave	100m		
Master cycle			
Bus cycle time(max)	100us		
Bus cycle time(default)	500us		
Priority	Configurable		
Special feature			
DC support		○	○
Cable redundancy support			○
Hot connect support			○
64bit Windows support	○	○	○
INtime multi kernel support	○	○	○
Master class specification			
Master-Class	Class B	Class A	Class A + FP

Table 5 : RSI -ECAT Master API List

Category	API	Contents
API Conversation	EhGetEhNodeStatus	Confirm Running Status of EcatHandler
	EhOpen	Open API Conversation to make APIs available
	EhClose	Close API Conversation
Master API	EhRqState	Change Request for Master State
	EhGetState	Get Current State and Now Requesting State
	EhWaitForCyclic	Wait for Starting Master Cyclic Process
	EhGetSystemInfo	Get EcatHandler info
	EhRequestAsyncOutputs	Starts one cycle of asynchronous data output
	EhSetOverrunCheck	Set info about a cyclic overrun check function
	EhGetOverrunCheck	Acquire info on a cyclic overrun check function
Slave API	EhGetSlaveCount	Get number of slaves on configuration(XML) definition
	EhGetOnlineSlaveCount	Get number of connected slaves
	EhFindSlave	Get detail info of slaves (VendorID, ProductCode, Instance)
	EhFindSlaveByAlias	Get detail info of slave which has designated alias
	EhFindSlaveBySlaveNo	Get detail info of slave which has designated slaves number
	EhGetSlaveStatus	Get status of the target slave
	EhGetALStatus	Gets AL status from the target slave
	EhGetALStatusCode	Gets AL status code from the target slave
	EhGetDLStatus	Gets DL status code from the target slave
	EhReadRegister	Read data in ESC-register which the target slave has
	EhWriteRegister	Write data in ESC-register which the target slave has
	EhReadEEPROM	Read data in EEPROM which the target slave has
	EhWriteEEPROM	Write data in EEPROM which the target slave has
	EhRecalcCheckSum	Update EEPROM checksum which the target slave has
Event API	EhSetEventFilter	Set filter for diagnosing event
	EhGetEventFilter	Get filter info for set diagnosing event

Category	API	Contents
Event API	EhWaitForEvent	Wait for diagnosing event
DI Category API	EhDiRead	Read 16 bit data of designated DI channel
	EhDiBlock	Read optional size of data from optional offset position of DI category
	EhDiGetChNums	Get number of channels of DI category.
DO Category API	EhDoWrite	Write 16 bit data to designated DO channel
	EhDoRead	Read 16 bit data of designated DO Channel
DO Category API	EhDoBlock	Write optional size of data to optional offset position of DO category
	EhDoGetChNums	Get Number of channels of DO Category
AI Category API	EhAiRead	Read 32 bit data of designated AI channel
	EhAiBlock	Read Optional size of data from optional offset position of AI category
	EhAiSetRange	Set range for designated AI slave
	EhAiGetRange	Get range for designated AI slave
	EhAiGetChNums	Get number of channels of AI category
AO Category API	EhAoWrite	Write 32 bit data to designated AO channel
	EhAoRead	Read 32 bit data of designated AO channel
	EhAoBlock	Write optional size of data to optional offset position of AO category
	EhAoSetRange	Set range for designated AO slave
	EhAoGetRange	Get range for designated AO slave
	EhAoGetChNums	Get number of channels of AO category
OD Access API	EhReadOD	Read data from OD(Object Dictionary) of designated slave
	EhWriteOD	Write data to OD(Object Dictionary) of designated slave
	EhReadODByAlias	Read data from designated index of slave which has designated alias
	EhWriteODByAlias	Write data to designated index of slave which has designated alias
VIOS Access API	EhGetViosInOffset	Get offset value of VIOS Input area of slave which has designated alias
	EhGetViosOutOffset	Get offset value of VIOS Output area of slave which has designated alias
	EhReadByte	Read 8 bit data from VIOS Input area
	EhReadWord	Read 16 bit data from VIOS Input area
	EhReadDword	Read 32 bit data from VIOS Input area
	EhWriteByte	Write 8 bit data to VIOS Output area
	EhWriteWord	Write 16 bit data to VIOS Output area
	EhWriteDword	Write 32 bit data to VIOS Output area
	EhReadbackByte	Read 8 bit data from VIOS Output Area
	EhReadbackWord	Read 16 bit data from VIOS Output area
	EhReadbackDword	Read 32 bit data from VIOS Output area
	EhGetViosInAddress	Get the VIOS Input memory address
	EhGetViosOutAddress	Get the VIOS Output memory address

C : Software APIs for Motion Control ("Motion Library") (presented by TECHNO Co., Ltd)

Motion Library is software APIs which partialize sophisticated motion control functions. You can develop your own motion control by embedding these APIs into user applications.

Software Configuration Figure using Motion Library :

※This Motion Library can be called from multi user applications.

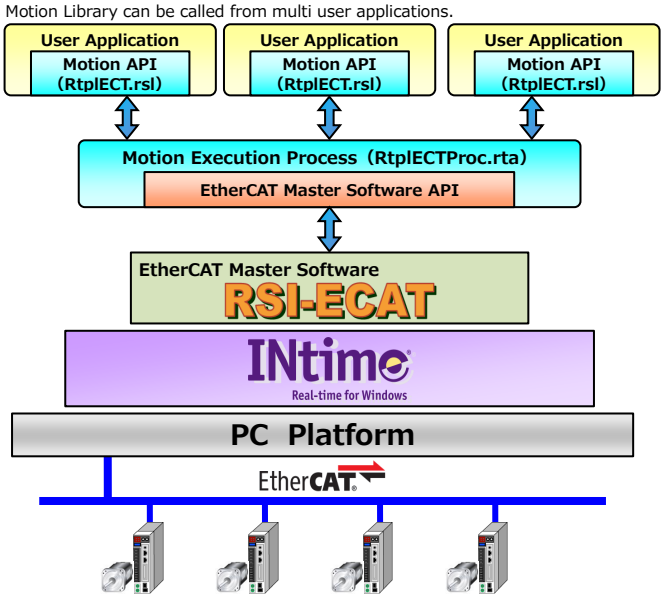

Figure 2 : Configuration Figure using MotionLibrary

Motion Library API List :

Category	API	Contents
Initial Process API	RtplECTInitializeLib	Initialize Librar
	RtplECTCloseLib	Close Library
	RtplECTResetLib	Reset Library
	RtplECTInitializeMaster	Initialize Master
	RtplECTCmdActive	Execute command
	RtplECTResWait	Wait for Response
	RtplECTInitializeAPIThread	Initialize API Resources a thread
	RtplECTReleaseAPIThread	Release API Resources
EtherCAT Communication API	RtplECTSetSDO	Write SDO
	RtplECTGetSDO	Read SDO
	RtplECTSetPDO	Write PDO
	RtplECTGetPDO	Read PDO
	RtplECTSetAllPDO	Write all PDO
	RtplECTGetAllPDO	Read all PDO
Monitoring API	RtplECTGetPosition	Monitor Position
	RtplECTGetVelocity	Monitor Velocity
	RtplECTGetStatus	Monitor Status
	RtplECTGetTorque	Monitor Torque
System Setting API	RtplECTDefinePosition	Position Preset
	RtplECTServoON	Servo ON
	RtplECTServoOFF	Servo OFF
	RtplECTClearAlarm	Servo Alarm Clear
	RtplECTStopPositioning	Stop Moving
	RtplECTHoldAxis	Pause
	RtplECTResumeAxis	Resume from Pause
	RtplECTSetGantryAxis	Set Synchronous Axis Control
	RtplECTResetGantryAxis	Release Synchronous Axis Control
	RtplECTSetOverride	Set Velocity Override
	RtplECTClearCmdBuff	Command Buffer Clear
	RtplECTClearScsError	System Error Clear
Moving API	RtplECTHomePosition	Origin
	RtplECTPositioning	Positioning
	RtplECTLinInterpolate	Linear Interpolation
	RtplECTLCirInterpolate	Circular arc Interpolation
	RtplECTLatchPositioning	Latch Positioning
	RtplECTJOGStart	JOG Feed
	RtplECTJOGStop	JOG Stop
	RtplECTTorqueCtrlStart	Start Torque Control
	RtplECTTorqueCtrlStop	Stop Torque Control
Other API	RtplECTGetVersion	Get Version

D : Motion Control Process Product ("Fine Motion")　(presented by TECHNO Co., Ltd)

Fine Motion is a motion control process product including sophisticated motion control functions.
Fine Motion itself can functionate as motion control process independently,
you can achieve motion control since user applications can exchange data via mailboxes.

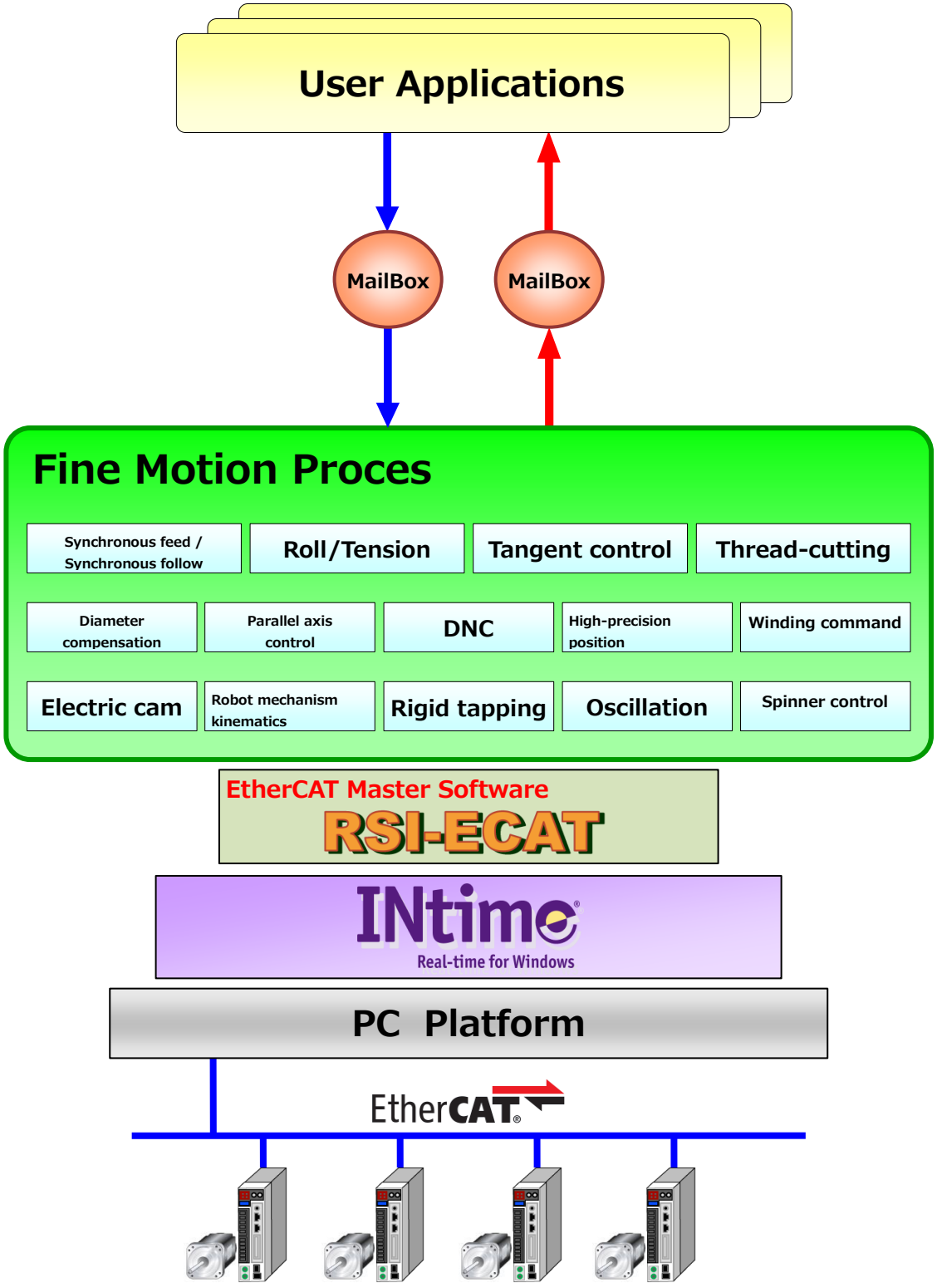

Figure 3 : Configuration Figure using Fine Motion

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