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5		02.12.21 – 05.12.21	
6		06.12.21 – 11.12.21	
7		12.12.21 – 13.12.21	
8		14.12.21 – 15.12.21	

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: 59 ., 14 ., 1 ., 17

(middleware)

(HRT),

(RTI),

ABSTRACT

Master's thesis: 59 pages, 14 figures, 1 appendices, 17 sources.

SOFTWARE, DISTRIBUTED SIMULATION, REAL-TIME SIMULATION ENVIRONMENT, INFORMATION SYSTEM

Software for distributed simulation of information systems often uses middleware to provide services to support their performance in distributed computing environments. This middleware covers many levels, from low-level support for data transfer through resource request brokers to high-level simulation functionality such as time management. The paper considers methods and tools for designing and implementing such intermediate software for distributed real-time simulation (HRT), for example, applications with hardware in the loop. The implementation of the real-time infrastructure (RTI) middleware software is described, the distributed modelling method and the performance of such tools are compared with the non-real-time implementation.

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1.3	HLA			15	
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1.5		,	'	HLA	17
1.6			HLA	18	
1.7	ADSF			18	
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2.6				30	
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3.1				37	
3.2		,		39	

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3.4	HLA.....	46
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-
- GUI – (Graphic User Interface)
- API – (Application Programming Interface)
- ClassAd – Classified Advertisement
- ID – identity
- FCFS – First-Come First-Served
- HAL – Hardware Abstraction Layer
- HLA – High Level Architecture ()
- HPF – Highest Priority First
- TORQUE – Terascale Open Source Resource and Queue Manager
- RTI – Run-time infrastructure
- SLURM – Simple Linux Utility for Resource Management
- VM – virtual machine
- VMM – Virtual Machine Monitor
- VPN – virtual private network

(HLA)

HLA,

(IFSpec) [1],

HLA

(RTI)

RTI-Kit,

RTI [2].

RTI

(WCT).

(RO)

HLA,

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(M&S),

Simulation Based

Acquisition (SBA) [1].

(ADD)

(Chelmae-II), M&S [2].

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(IEEE) 2000 [1]. M&S

HLA. ChangJo21, ChungHae

ChangGong ChunJaBong

HLA [5, 6, 7].

M&S RDSE

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(TCP/IP)

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<http://www.opal-rt.com>),

(RTOS).

HLA , (OMT)
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1.5 , ' HLA

[6] HLA Federation Class (HFC) HLA
Automation Tool (HAT) HLA . Belanger

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C++ Java, BulleitionBoard
Executor. . [16] FedProxy
Java
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(ASF),
(DIS) HLA
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RTI Object Model (ROM),
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Raytheon, (FMS)
 T&E Patriot. FMS – T&E,
 M&S T&E,
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M&S T&E

[20].

, Raytheon Standard Missile
 (SM)-3, HLA [21].

Gepard Hardware-in-Loop (HIL)

M&S, HLA,

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Gepard [22].

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HLA, TCP/IP

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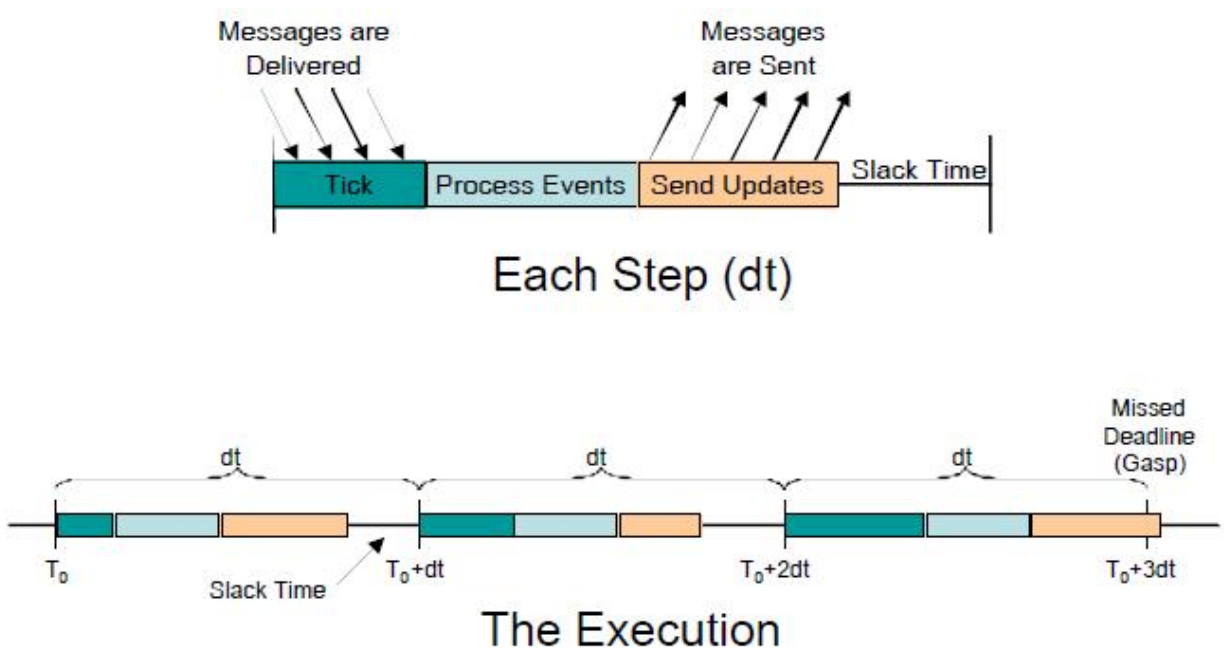
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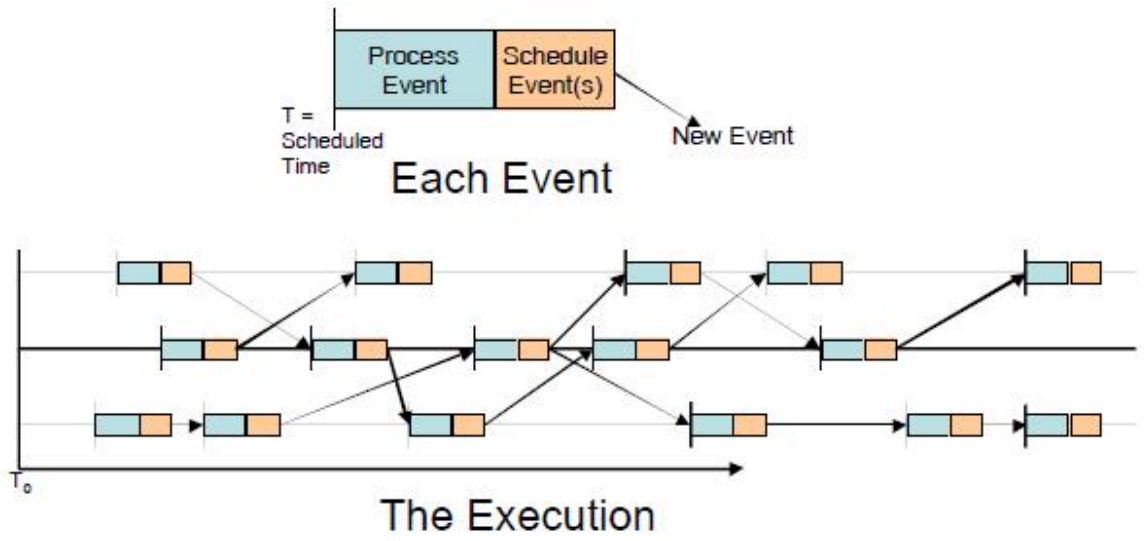
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Georgia Tech RTI-Kit,

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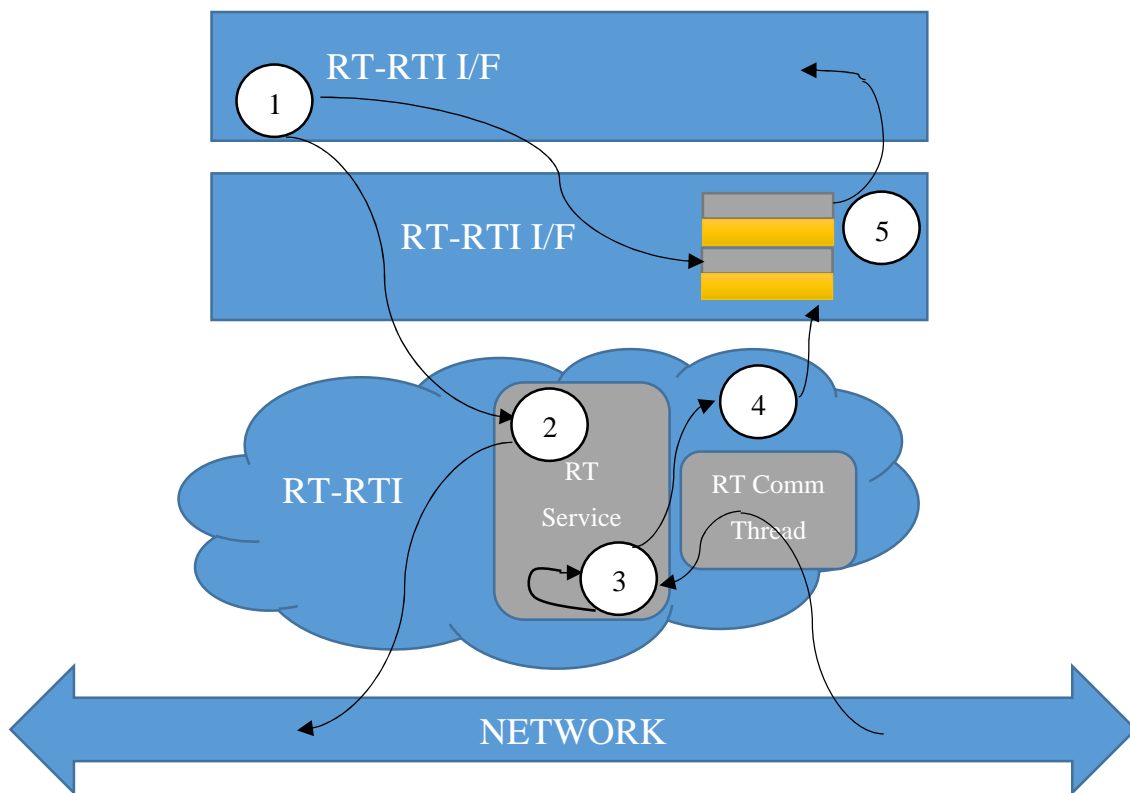
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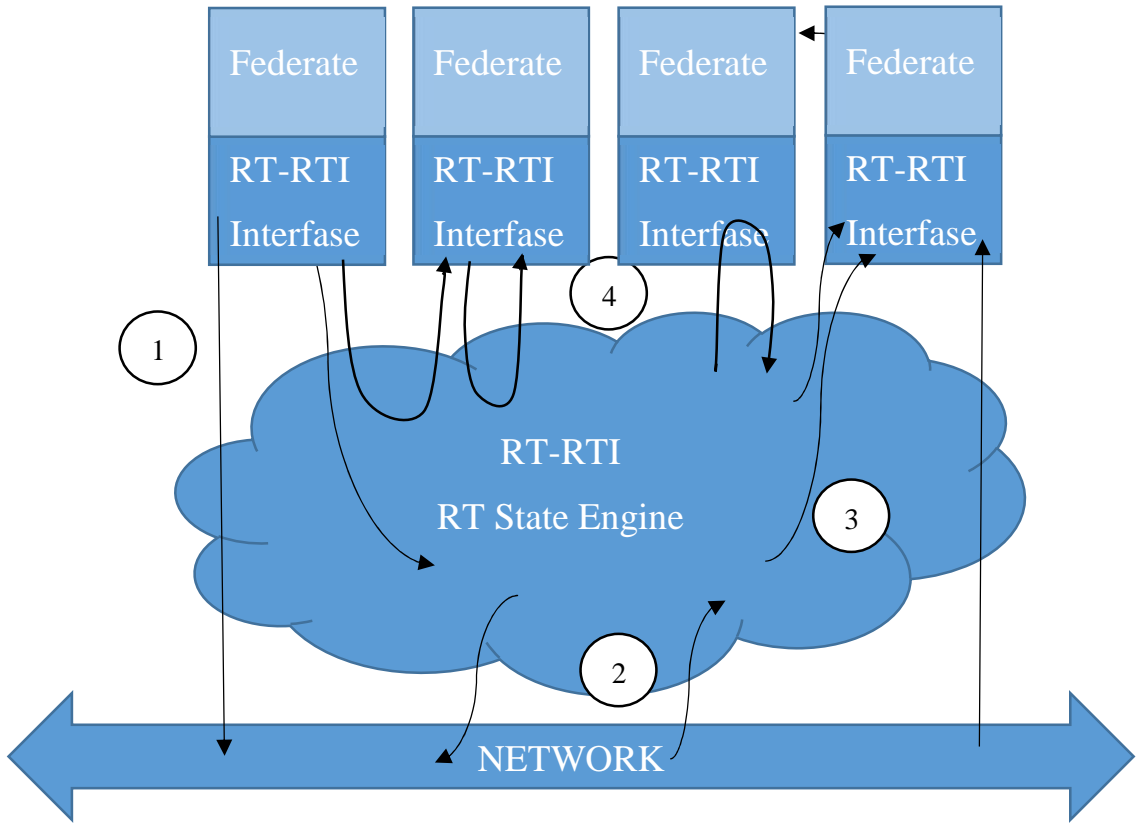
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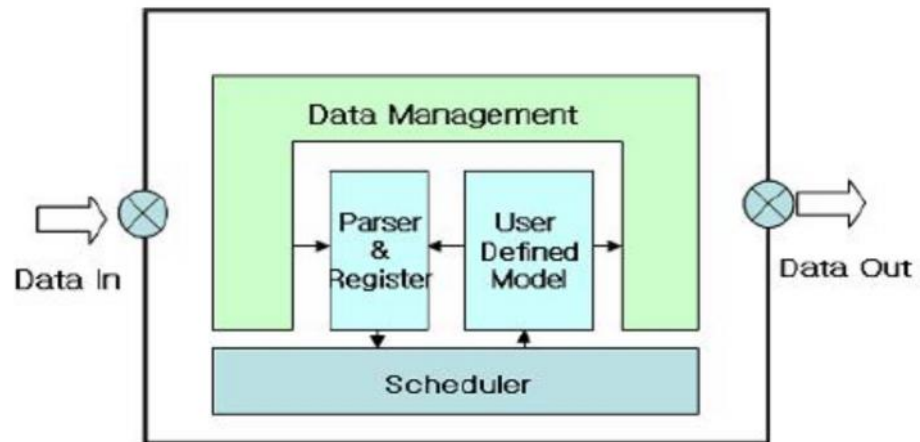
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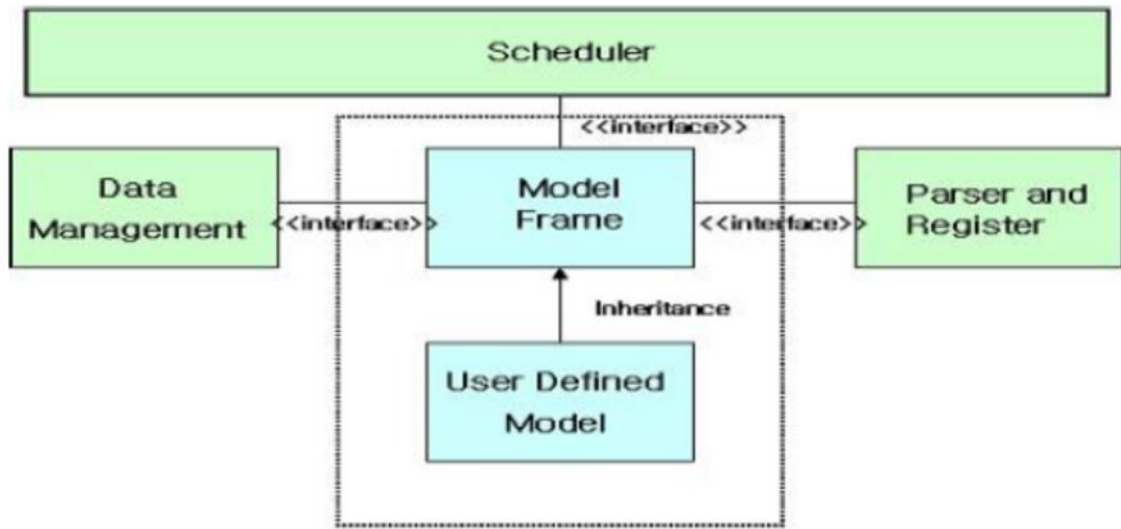
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User Defined Model

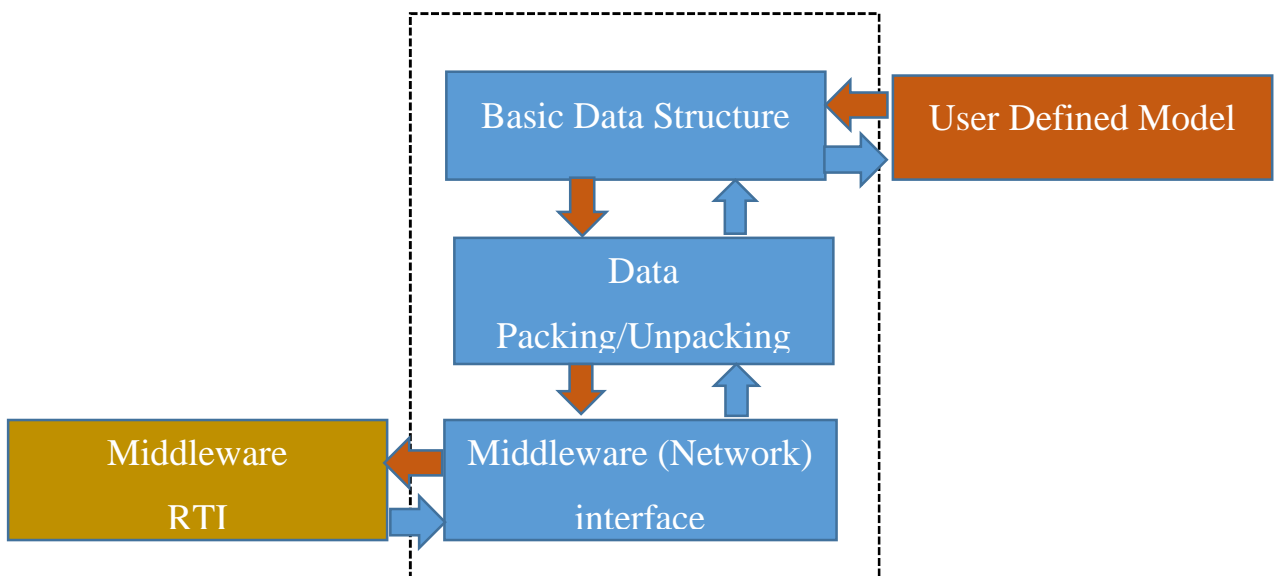
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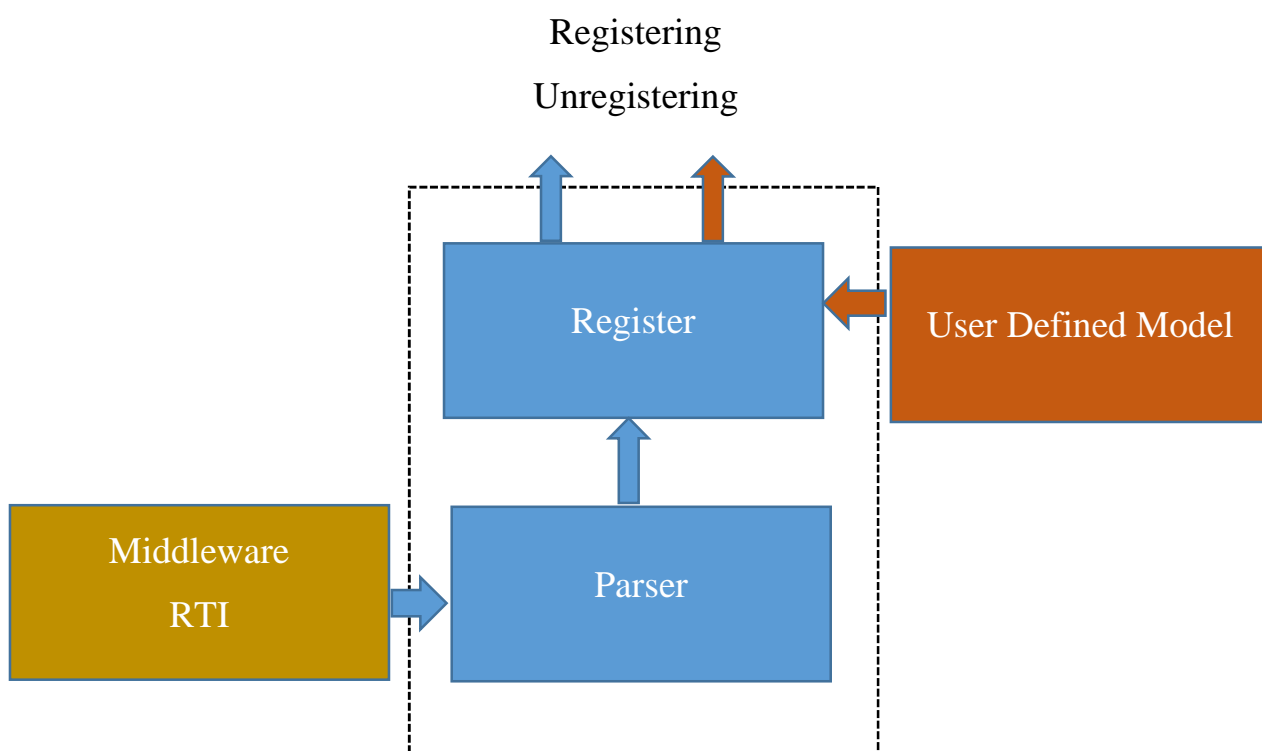
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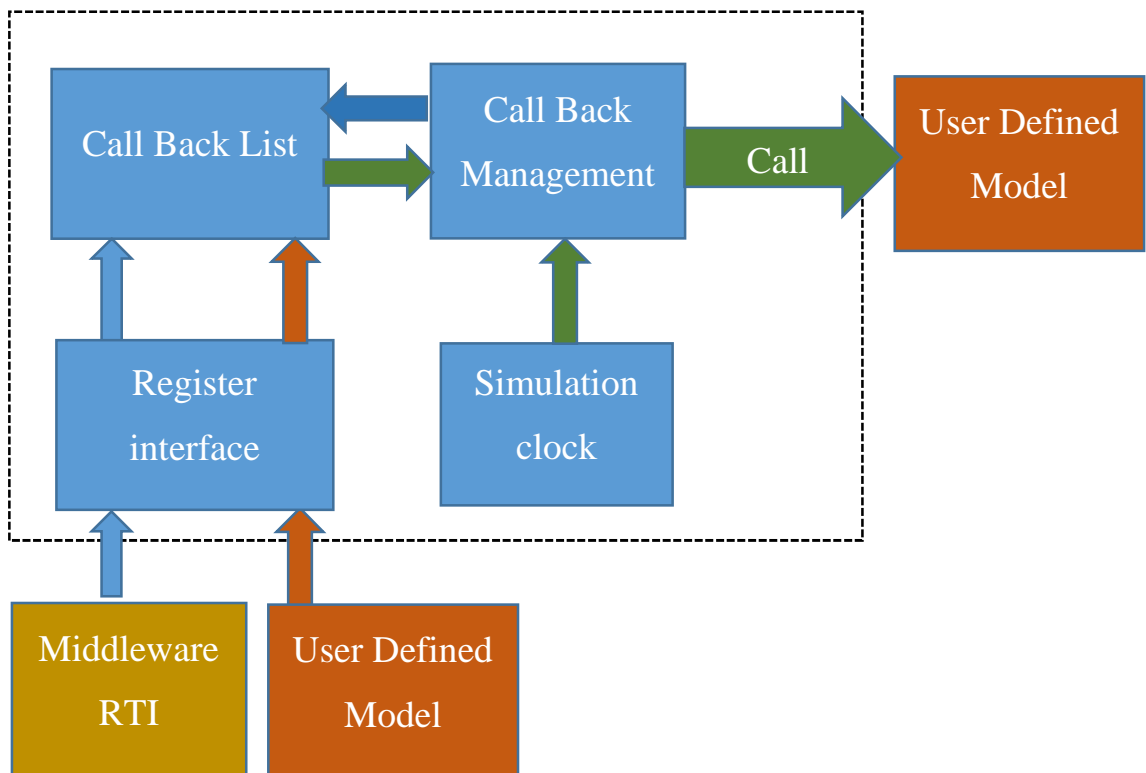
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3 RTI

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SGI Origin,

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RTI-Kit

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DRTI (Detailed-RTI),

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3.0 Federated-simulation Development Kit (FDK).

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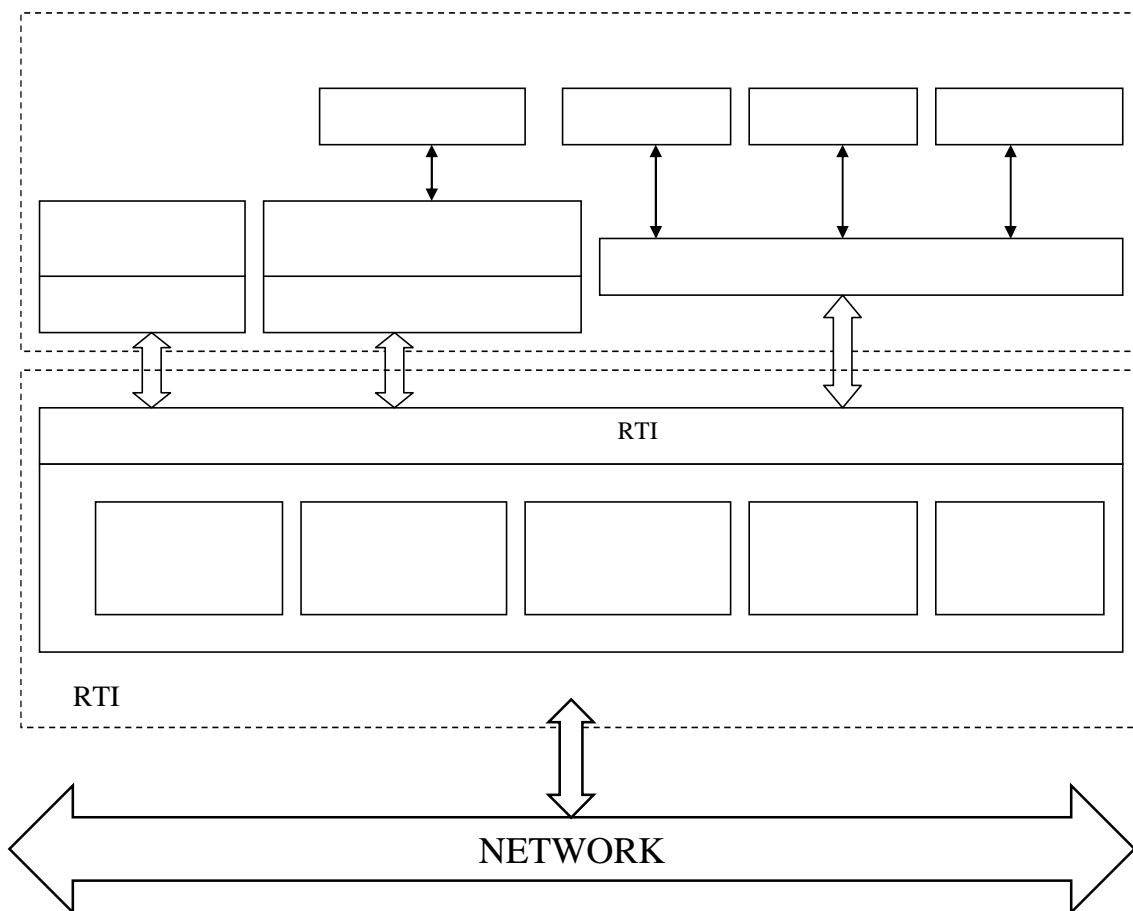
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RTI-Kit.

MPI.

RTI-Kit

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3.1 -

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RTI-Kit

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ECho — ,

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Microsoft Windows. Echo

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MCAST, Echo. MCAST

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(CM), Echo, API,

MCAST , CM

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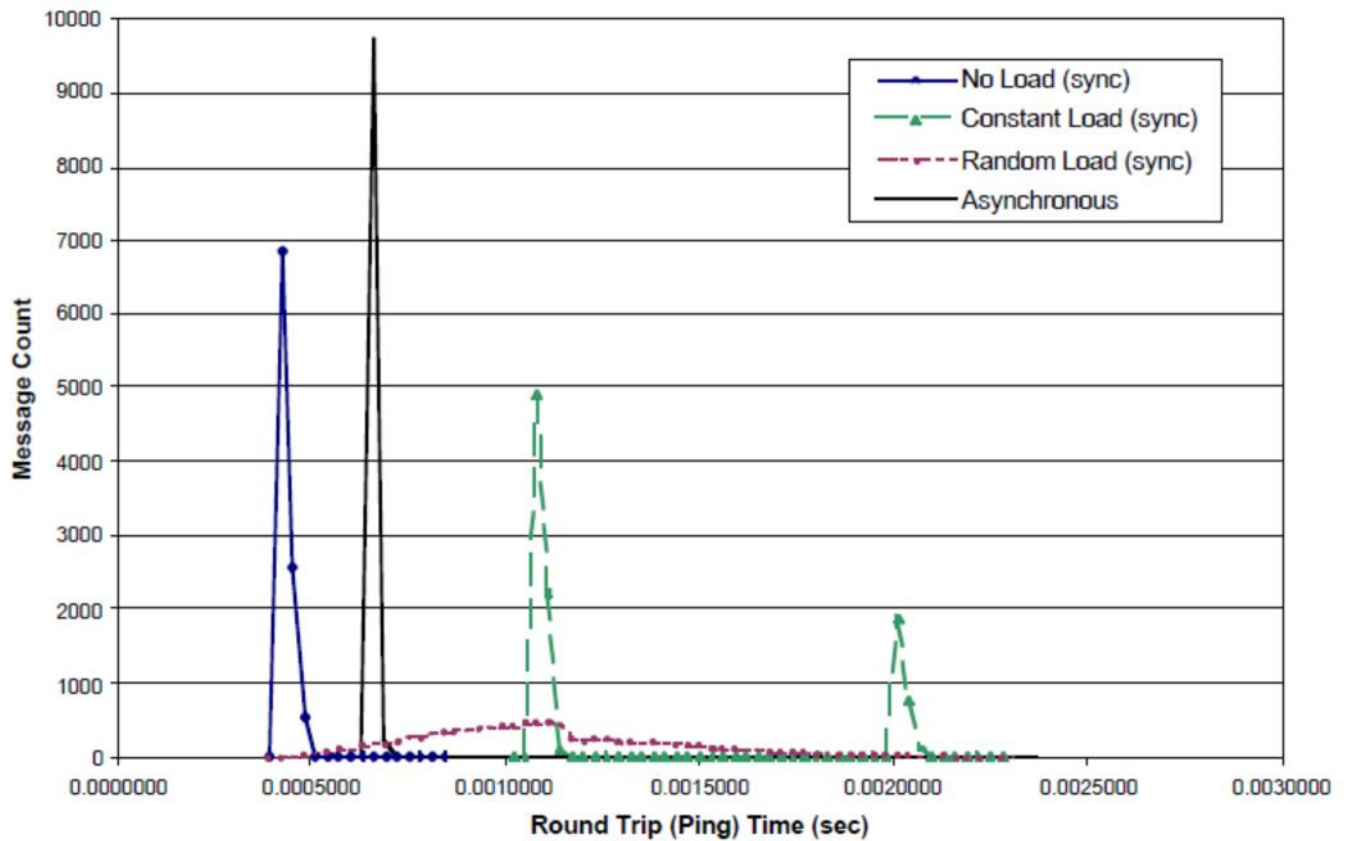
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Round Trip Delay for Synchronous and Asynchronous Delivery



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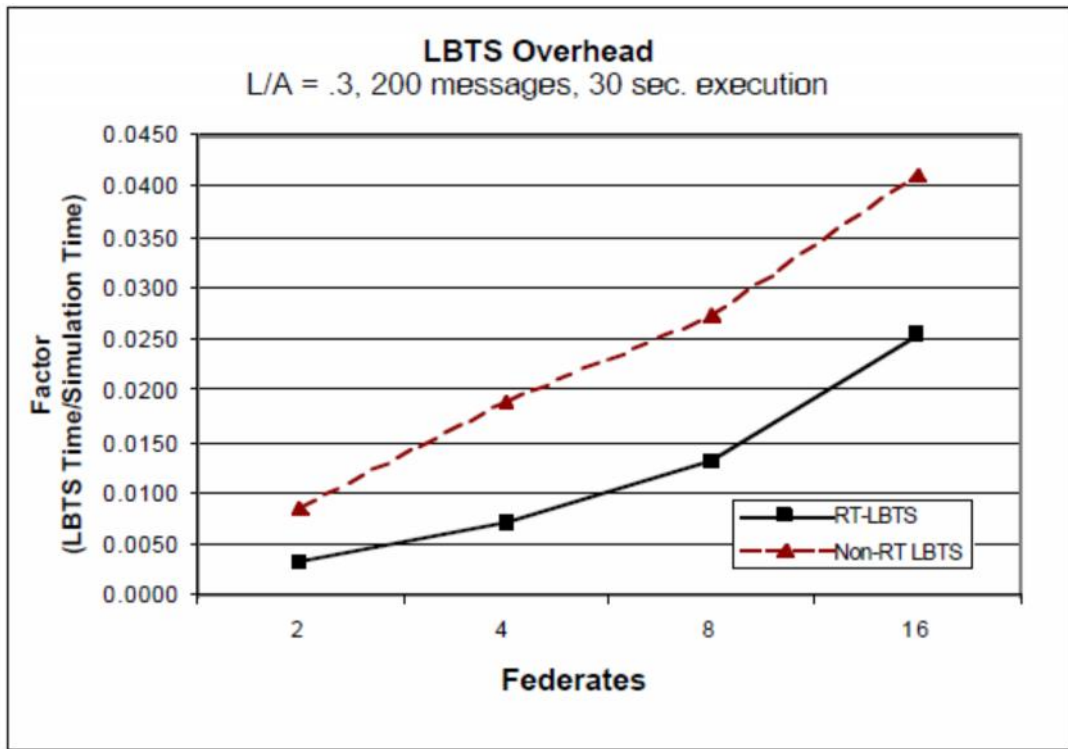
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