

High Level Architecture

Module 1

Basic Concepts



The Society for
Computer
Simulation



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Module 1

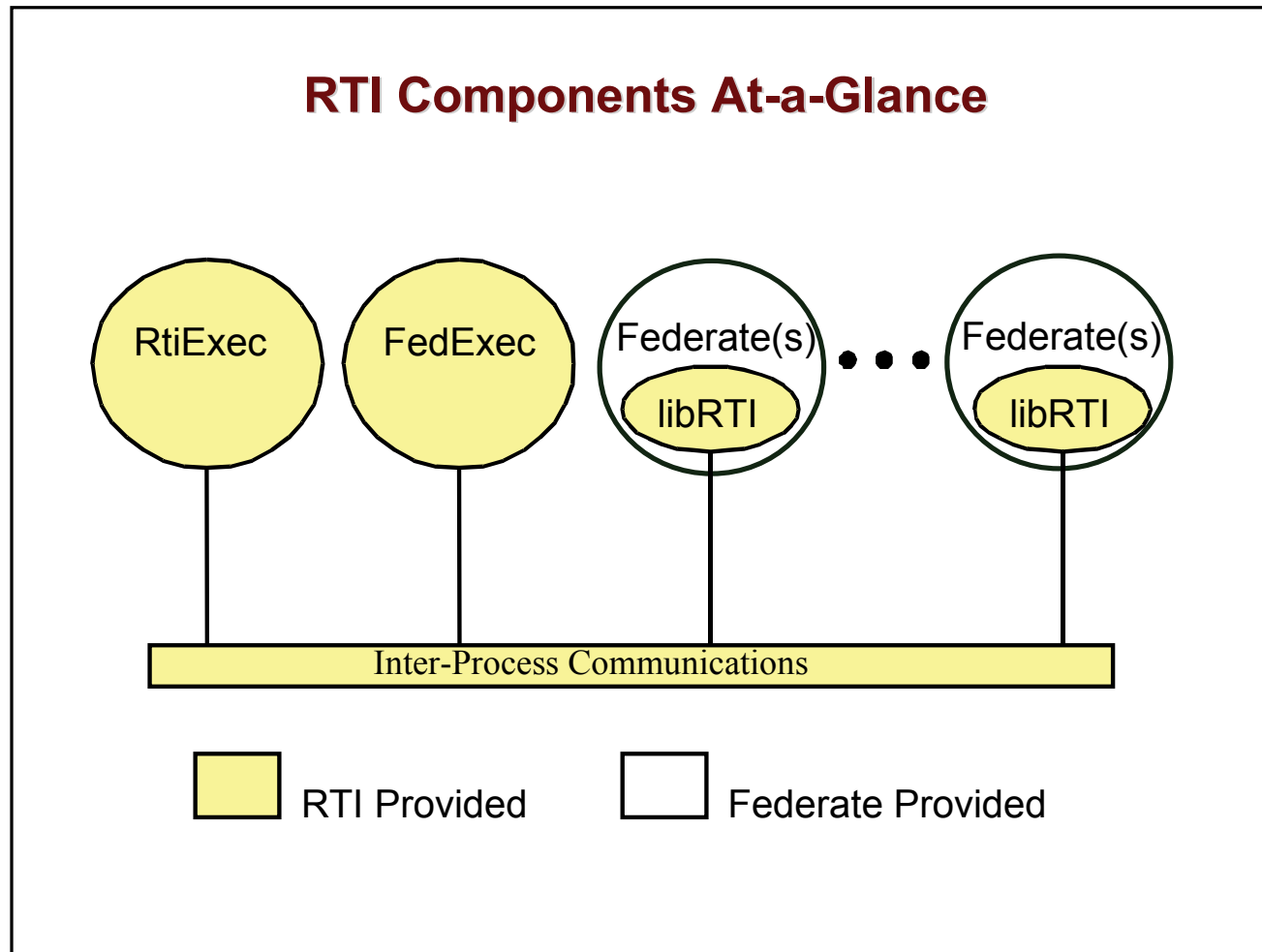
Basic Concepts

Lesson 2

Basic Structure of HLA Simulations



Logical View of RTI Components



FedExec - The Federation Executive

- One running process per executing federation
 - Created by first federate to successfully join federation
- Manages multiple federates joining and leaving the federation execution
 - Assigns unique handles to each federate
- Facilitates data exchange between federates
- Console interface for manual operations



rtiExec - The RTI Executive

- Manages the creation and destruction of multiple federation executions (with different names)
 - Ensures that each FedExec has a unique name
- Global process executes on one platform
- Listens to a well known port
- Console interface for manual operations



libRTI - The RTI Library

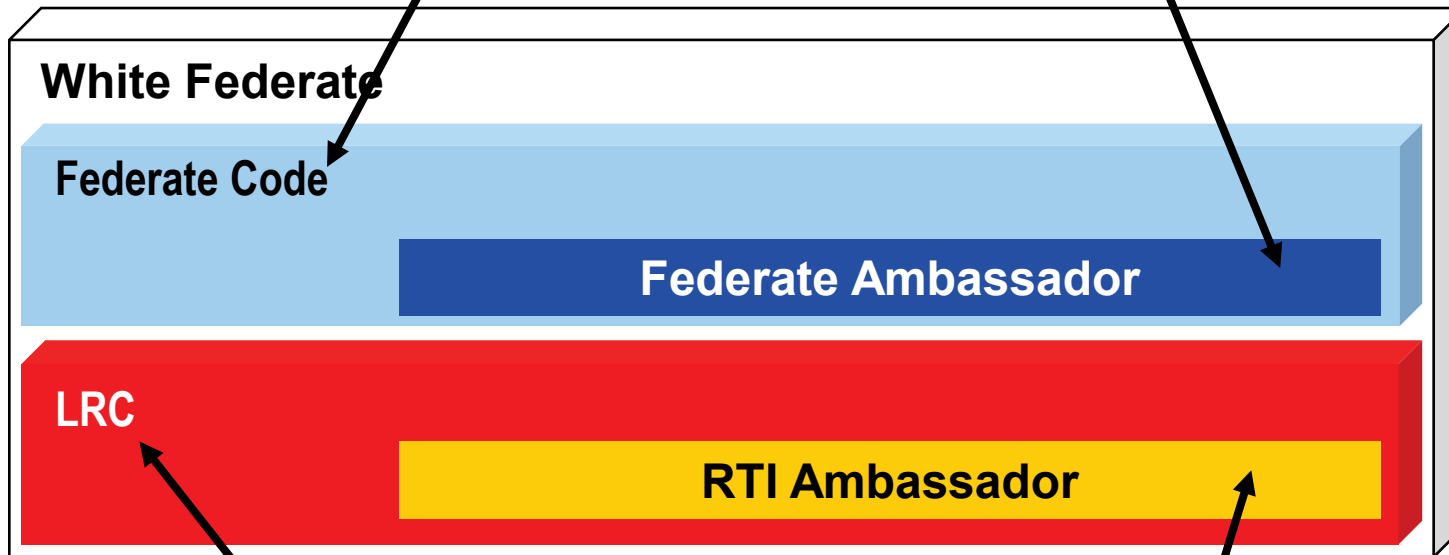
- Makes HLA service methods available to federates
 - Methods communicate with rtiExec, FedExec, and other federates through them
- Written in C++ with interfaces in C++, Java, CORBA IDL, Ada



What's in a Federate?

The Federate's Code provides internal functionality.

The Federate's code must define the abstract `RTI::FederateAmbassador` class

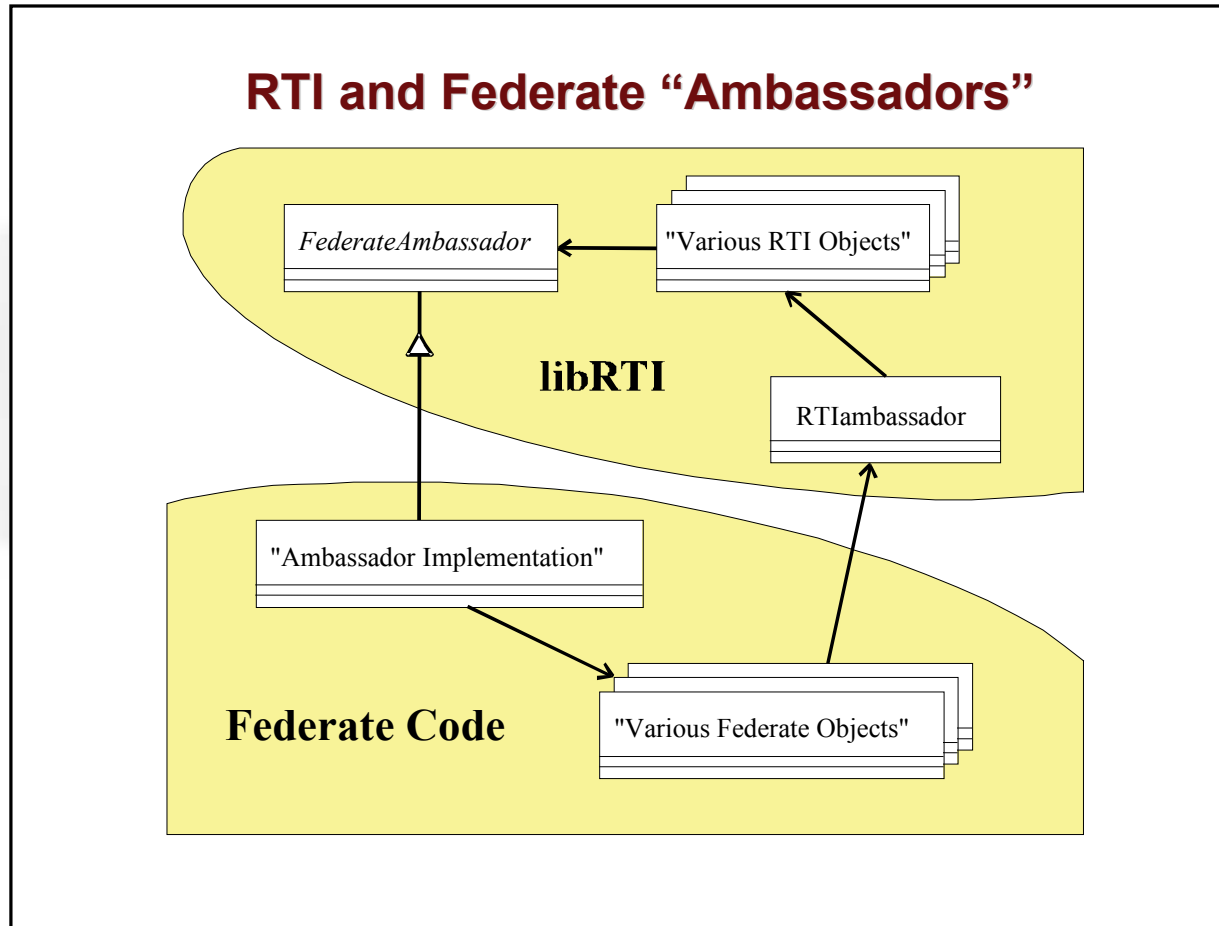


The Local RTI Components (LRC) provide external functionality as specified by the IFSpec.

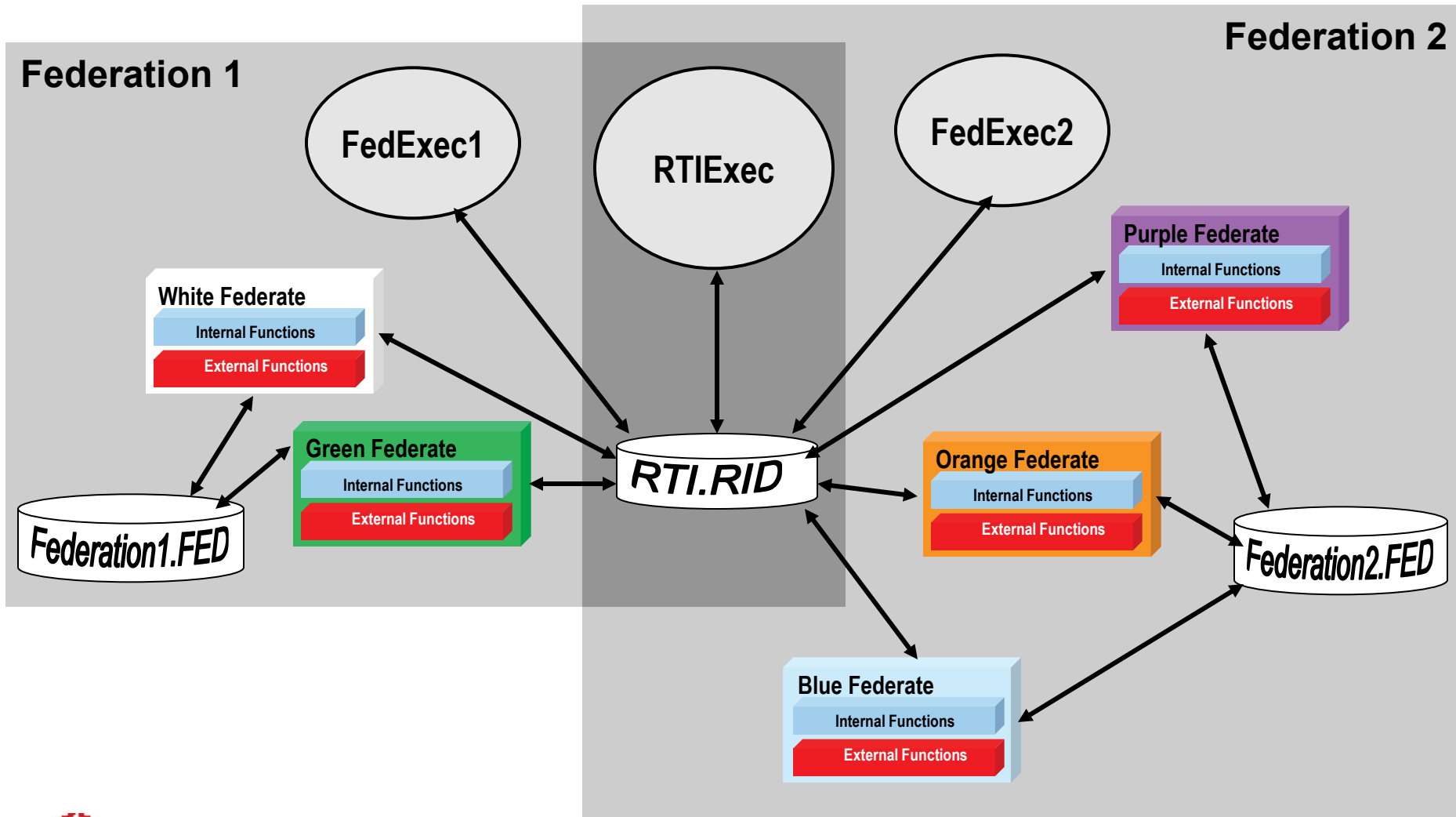
The LRC include the methods for the `RTI::RTIAmbassador` class



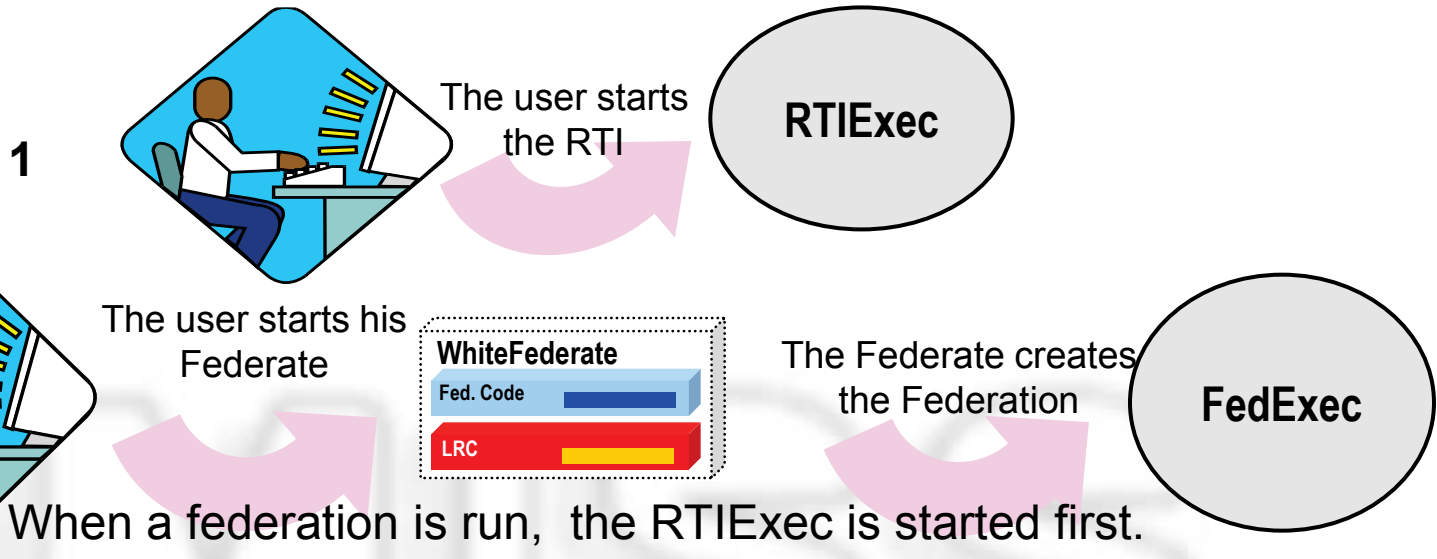
RTI and Federate Ambassadors



The Big Picture

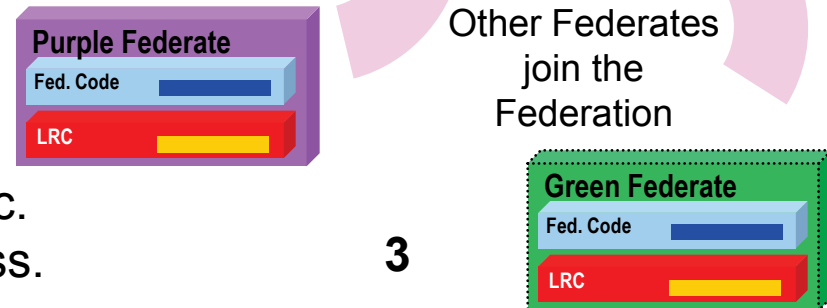


The Process



Then a federate, acting as a manager, creates a federation execution by invoking the RTI method “createFederationExecution” on its RTI Ambassador. The RTIAmbassador then reserves a name with RTIExec, and spawns a FedExec process, and that FedExec registers its communication address with RTIExec. The federation execution is underway.

Once a federation execution exists, other federates can join it. That RTIAmbassador consults RTIExec to get the address of FedExec, and invokes joinFederationExecution on FedExec. Additional federates can join via the same process.



Content of an IF Specification

- Interface Name and Brief Description of Service
- Supplied Arguments
- Returned Arguments
- Pre Conditions
- Post Conditions
- Exceptions
- Related Services



Sample RTI Service Request

```
try
{
    rtiAmb.timeAdvanceRequest(requestTime);
}
catch (RTI::Exception& e)
{
    cerr << "FED_HW: ERROR:" << &e << endl;
}
```



Possible Exceptions Thrown

- The federation time is invalid.
- Federation time already passed.
- The TimeAdvanceRequest is already pending.
- The federate is not a federation execution member.
- Save in progress.
- Restore in progress.
- RTI internal error.



Using “Tick”

- Tick used To Wait for Service Completion
 - Allows RTI a chance to execute and respond to request
 - Waits for not more than 1.0 sec's, nor less than .01 sec's
- *timeAdvGrant* is a global variable, initialized to false, set *true* in callback routine *TimeAdvanceGrant*[†]

```
timeAdvGrant = RTI::RTI_FALSE;  
  
while (!timeAdvGrant)  
{  
    rtiAmb.tick(0.01, 1.0);  
}
```



HelloWorld Code Responsibilities

- 1. Create and destroy the federation.
- 2. Join and Resign from the federation.
- 3. Declare data to be published and subscribed to by the federation.
- 4. Send/ Receive data to/ from other federates.



Obtaining the RTI

The screenshot shows the HLA Software Distribution Center website. The left sidebar contains a list of links: HLA Home Page, General Information, HLA Policy and Transition Reports, HLA Technical Specifications, HLA Compliance Testing, Runtime Infrastructure (RTI), Federation Development Processes and Tools, HLA Software Distribution Center, HLA Education and Training, HLA Related Standards, and Published Papers. The main content area features a header with navigation links (Back, Forward, Reload, Home, Search, Guide, Print, Security, Stop) and a central banner with the HLA logo. Below the banner are four buttons: Distribution Center, Products, Register, and Download. The main heading is 'HLA Software Distribution Center'. Below this, a welcome message states: 'Welcome to the HLA Software Distribution Center. DMSO has sponsored the development and distribution of software that supports the HLA Federation Development process and has made it available for download. Software in the following categories is currently available for download: (RTI) and Tools (OMDT)'. Three numbered callouts are overlaid on the image: 1- See a complete list of the software and documents available for download (pointing to the sidebar); 2- You must register to be able to download the RTI (pointing to the Register button); 3- Once activated, download the RTI (pointing to the Download button).

1- See a complete list of the software and documents available for download

2- You must register to be able to download the RTI

3- Once activated, download the RTI



www.hla.dmso.mil ("Software Distribution Center" bullet)

The RTI Distribution

