

## APP4RTA – version 1.0

The screenshot shows the APP4RTA Java GUI software interface. The window title is "APP4RTA". The interface includes a header bar with a logo and the text "APP4RTA". Below the header, there is a section for "Enter IA" with a "Default IA" button and a row of 14 input fields labeled T0 through T13. To the right of these fields are three buttons: "Enter IA", "Calculate", and "Reset". Below the input fields, there is a list of components: 0: ARM0, 1: ARM1, 2: ARM2, 3: ARM3, 4: Denver0, 5: Denver1, and 6: GPU. To the right of this list are four radio button options: "Synchronous", "Worst Case", "Asynchronous", "Average Case", and "Best Case". The main area of the interface is divided into two rows of component boxes. The top row contains four boxes labeled ARM0, ARM1, ARM2, and ARM3. The bottom row contains three boxes labeled Denver0, Denver1, and GPU. To the right of these boxes is a "Response Time Sum" section with a text input field and a scroll bar.

Before executing the code, please install the Java GUI software.

- To install Java GUI softwares:  
'Help' -> 'Install New Software' -> Work with: Eclipse Repository -  
<http://download.eclipse.org/releases/oxygen> -> 'General Purpose Tools' -> all click from 'Swing Designer' to 'WindowBuilder XML Core (requires Eclipse WTP/WST)' -> 'Next' -> 'Next' -> 'accept' -> 'Finish'

### 1. 'Default IA' Button

When the button is clicked, the JTextFields from T0 to T13 would be filled according to the default integer array, `{ 4, 1, 1, 3, 4, 0, 1, 3, 3, 0, 6, 2, 5, 6 }` which is predefined in CpuRTA class.

The screenshot shows the 'Enter IA' section of the APP4RTA application. The 'Default IA' button is highlighted. Below it, the input fields T0 through T13 are filled with the values: 4, 1, 1, 3, 4, 0, 1, 3, 3, 0, 6, 2, 5, 6. To the left of these fields, there are labels for ARM0, ARM1, ARM2, ARM3, Denver0, Denver1, and GPU. To the right, there are radio buttons for Synchronous, Asynchronous, Worst Case, Average Case, and Best Case.

Or one can manually type in a number between 0 to 6 to each and every JTextField.

### 2. Select a Transmission Type (Synchronous / Asynchronous) and a Execution Case(Worst Case / Average Case / Best Case)

This section shows the selection of transmission type and execution case. The 'Synchronous' radio button is selected. The 'Worst Case' radio button is selected. The 'Asynchronous', 'Average Case', and 'Best Case' radio buttons are unselected.

### 3. 'Enter IA' Button

The screenshot shows the main window of the APP4RTA application. The 'Enter IA' button is highlighted. Below it, the 'Calculate' and 'Reset' buttons are visible. The application window also displays the ARM0, ARM1, ARM2, ARM3, Denver0, Denver1, and GPU sections, each with a list of tasks and a corresponding input field. The 'Response Time Sum' section is also visible at the bottom right.

When the button is clicked, every task (T0 to T13) would be mapped to a Processing Unit according to the assigned number and appear on the left list of every Processing Unit. Task Sorting would be automatically applied according to Rate Monotonic Scheduling, so the first task on the left list has the shortest period among the tasks on the same list.

#### 4. 'Calculate' Button

The screenshot shows the APP4RTA software interface. At the top, there's a header with the APP4RTA logo and window controls. Below the header, there's a section for task assignment with buttons for 'Enter IA', 'Default IA', and 'Calculate'. A table shows tasks T0 to T13 assigned to processing units: T0 (4), T1 (1), T2 (1), T3 (3), T4 (4), T5 (0), T6 (1), T7 (3), T8 (3), T9 (0), T10 (6), T11 (2), T12 (5), T13 (6). Below this, there are radio buttons for 'Synchronous' (selected), 'Asynchronous', 'Worst Case' (selected), 'Average Case', and 'Best Case'. A list on the left shows processing units: 0: ARM0, 1: ARM1, 2: ARM2, 3: ARM3, 4: Denver0, 5: Denver1, 6: GPU. The main area displays task lists for each unit: ARM0 (Planner, PRE\_Detection), ARM1 (DASM, Lidar\_Grabber, PRE\_SFM\_gpu), ARM2 (Localization), ARM3 (CANbus\_pollin, PRE\_Lane\_de, PRE\_Localizati), Denver0 (EKF, OS\_Overhead), Denver1 (Lane\_detector), and GPU (SFM Detection). A 'Response Time Sum' box at the bottom right shows '647320682500 ps'.

When the button is clicked, a corresponding response time to every task would be calculated and appeared on the right list. The total sum of all tasks' response times would be also calculated and appeared on the TextArea at the bottom right. If one or more tasks are not schedulable then 'Non Schedulable!' message would appear in the TextArea.

## 5. 'Reset' Button

The screenshot shows the APP4RTA application window. At the top, there is a title bar with the text 'APP4RTA' and standard window controls (minimize, maximize, close). Below the title bar, there is a toolbar with buttons for 'Enter IA', 'Default IA', and 'Reset'. The 'Reset' button is highlighted in red. To the right of the toolbar, there is a list of task names: T0, T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12, T13. Below the task names, there is a section for configuration options. It includes a list of task types: 0: ARM0, 1: ARM1, 2: ARM2, 3: ARM3, 4: Denver0, 5: Denver1, 6: GPU. There are also radio buttons for 'Synchronous' (selected), 'Asynchronous', 'Worst Case' (selected), 'Average Case', and 'Best Case'. To the right of the configuration options, there are buttons for 'Enter IA', 'Calculate', and 'Reset'. The 'Reset' button is highlighted in red. Below the configuration options, there is a section for task results. It includes a grid of 12 empty boxes for ARM0, ARM1, ARM2, and ARM3. Below the grid, there is a section for 'Response Time Sum' with a text input field and a 'Calculate' button.

When the button is clicked, every list, JTextField and TextArea would be clear. One could do the test again with another integer array.

**\* 'GPU Task on CPU' part has not been implemented yet, so when T10 – T13 Tasks are mapped to CPU, the result would be not accurate for now.**