# AUTOSAR Model

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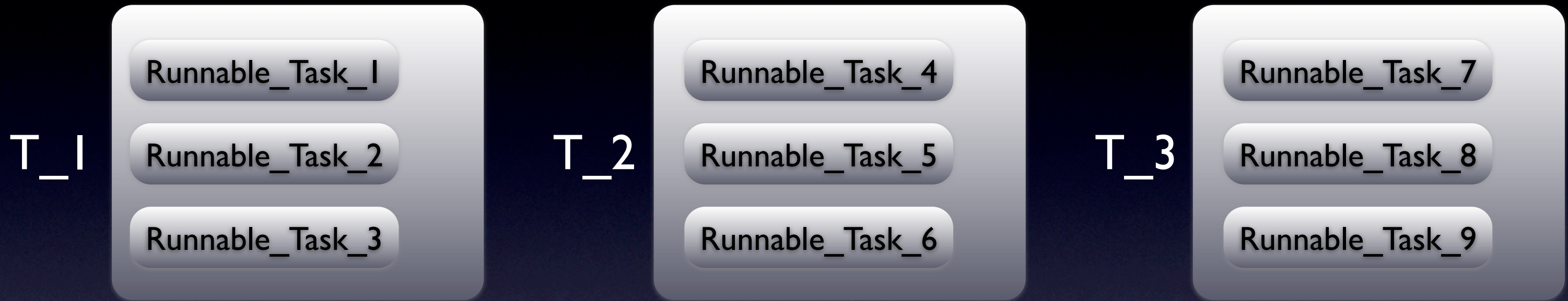14 Feb 2011

# WatchDog Manager

- Ability to use existing C-code

- Includes Alive Indication, Deadline processing

- Includes Runnable Task pre-condition for RT_n's, events, and data

- Trace logic flow of runnable tasks, faults

- Inject data structure faults or modify setup tables at specific times

- Use VisualSim Platform: Basic Blocks + Virtual_Machine

# Electronic Control Units -- ECUs

**ECU_1**

T_1

T_3

**ECU_2**

T_2

VB
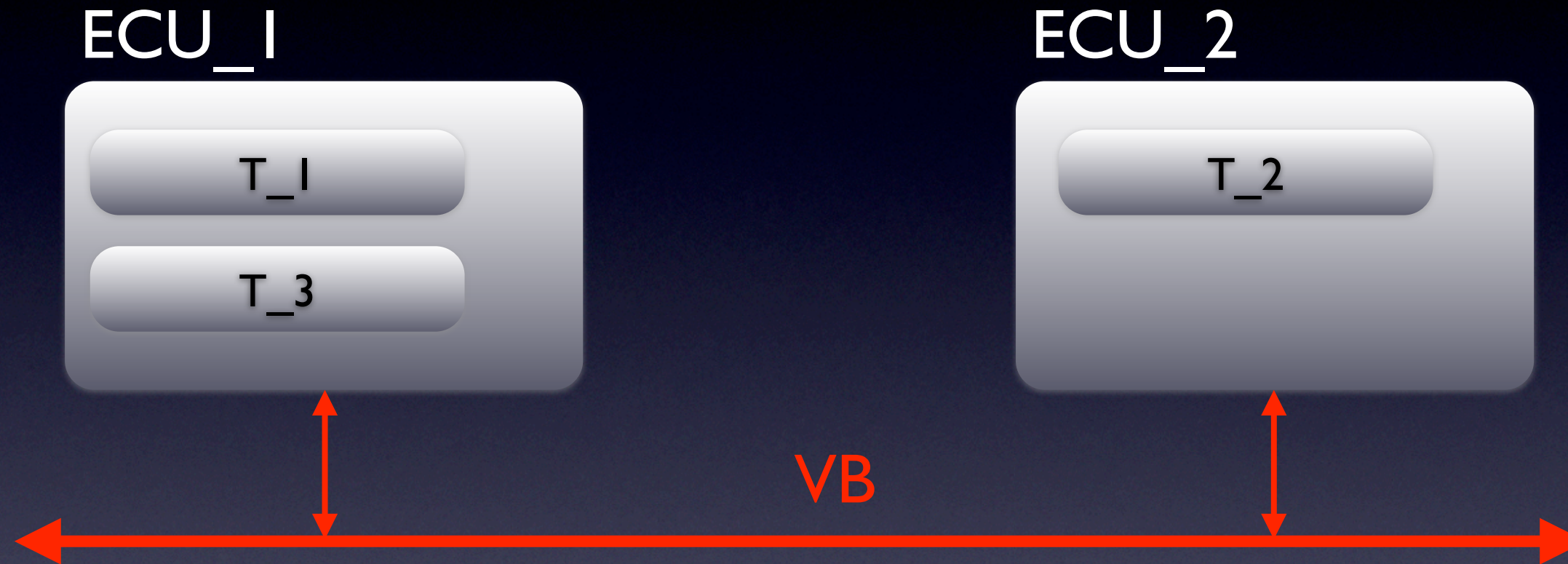
- Virtual Bus (VB) can be CAN, FlexRay, etc.

- ECU's have pre-emptable Runnable Task Queues

- T_n's (Runnable Task groups) are assigned to ECU's.

# Software Components -- T_n



T_1

Runnable_Task_1
Runnable_Task_2
Runnable_Task_3

T_2

Runnable_Task_4
Runnable_Task_5
Runnable_Task_6

T_3

Runnable_Task_7
Runnable_Task_8
Runnable_Task_9

Task_Table: Task, ECU, RT_Arr
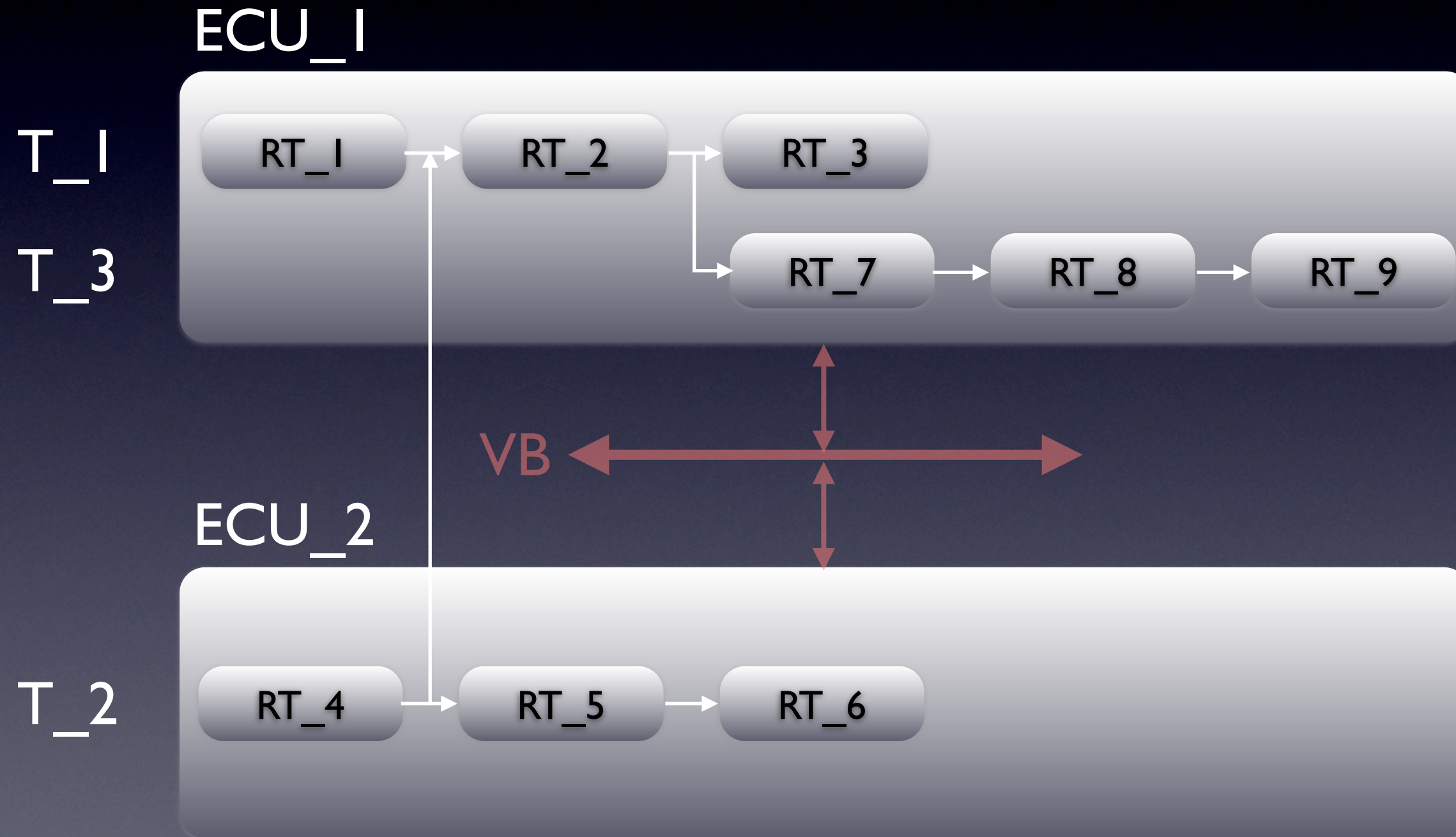Schedule_Table: Expiry, Name, ECU, Offset, Tasks
Set_Event_Table: ID, Runnable_Task, Priority, Time, Pre_Condition
Data_Table: ID, Data_Name, Data, Period
Alive_Supervisor: ID, Checkpoint, WdgMExpectedAliveIndications,
  WdgMSupervisionReferenceCycle, WdgMSupervisionReferenceCycle,
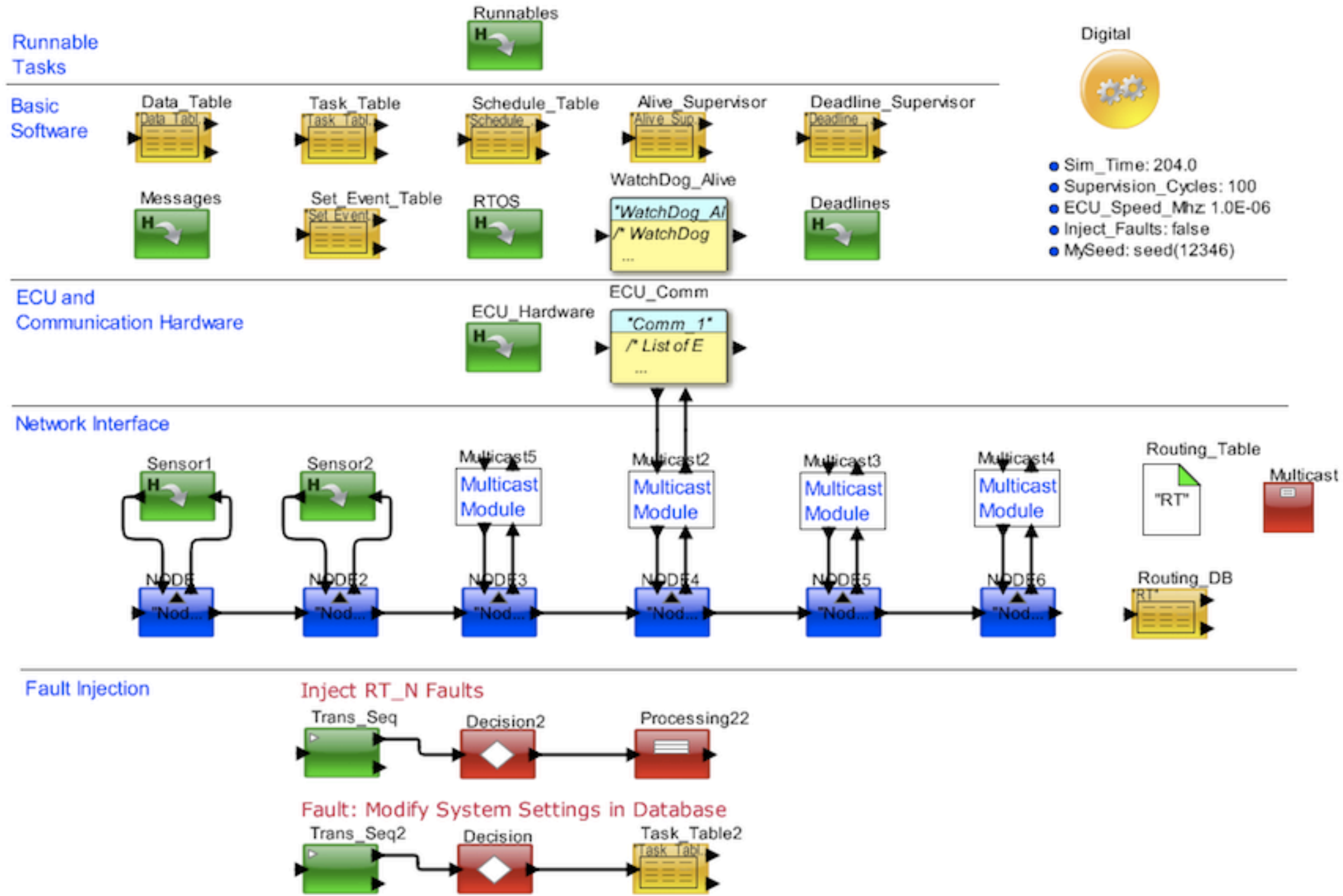  WdgMMinMargin, WdgMMaxMargin
Deadline_Supervisor: ID, Deadline, CP_Start, CP_End, WdgMDeadlineMin,
  WdgMDeadlineMax

# Cooperative ECU, T_n Execution

ECU_1

T_1

RT_1 → RT_2 → RT_3

T_3

RT_7 → RT_8 → RT_9

VB

ECU_2

T_2

RT_4 → RT_5 → RT_6

# AUTOSAR Model -- Next Side

Autosar: Configuring the Scheduler, Tasks, Runnables and the Watchdog

# Schedule_Table, Task_Table



**Edit parameters for Schedule_Table**

Block_Documentation:
```
Schedule Table
Identifies Expiry ID, Name, Offset timing, Task array
```

Linking_Name: "Schedule_Table"

Data_Structure_Text:
```
/* Schedule Table Template. */
Expiry Name      Offset    Tasks          ;
  1    EP_1        5        {"T_1"}        ;
  2    EP_2       15        {"T_2"}        ;
  3    EP_3       30        {"T_3"}        ;
```

Input_Fields: "Name"

Lookup_Fields: "Name"

Output_Expression: "output = match" /* FORMAT output = match.fieldb */

Mode: Read

Commit    Add    Remove    Preferences    Help    Cancel

**Edit parameters for Task_Table**

Block_Documentation:
```
Task Table
```

Linking_Name: "Task_Table"

Data_Structure_Text:
```
/* Task Table Template    */
ID Task    ECU       RT_Arr               ;
 1 T_1     ECU_1    {"RT_1","RT_2","RT_3"} ;
 2 T_2     ECU_2    {"RT_4","RT_5","RT_6"} ;
 3 T_3     ECU_1    {"RT_7","RT_8","RT_9"} ;
```
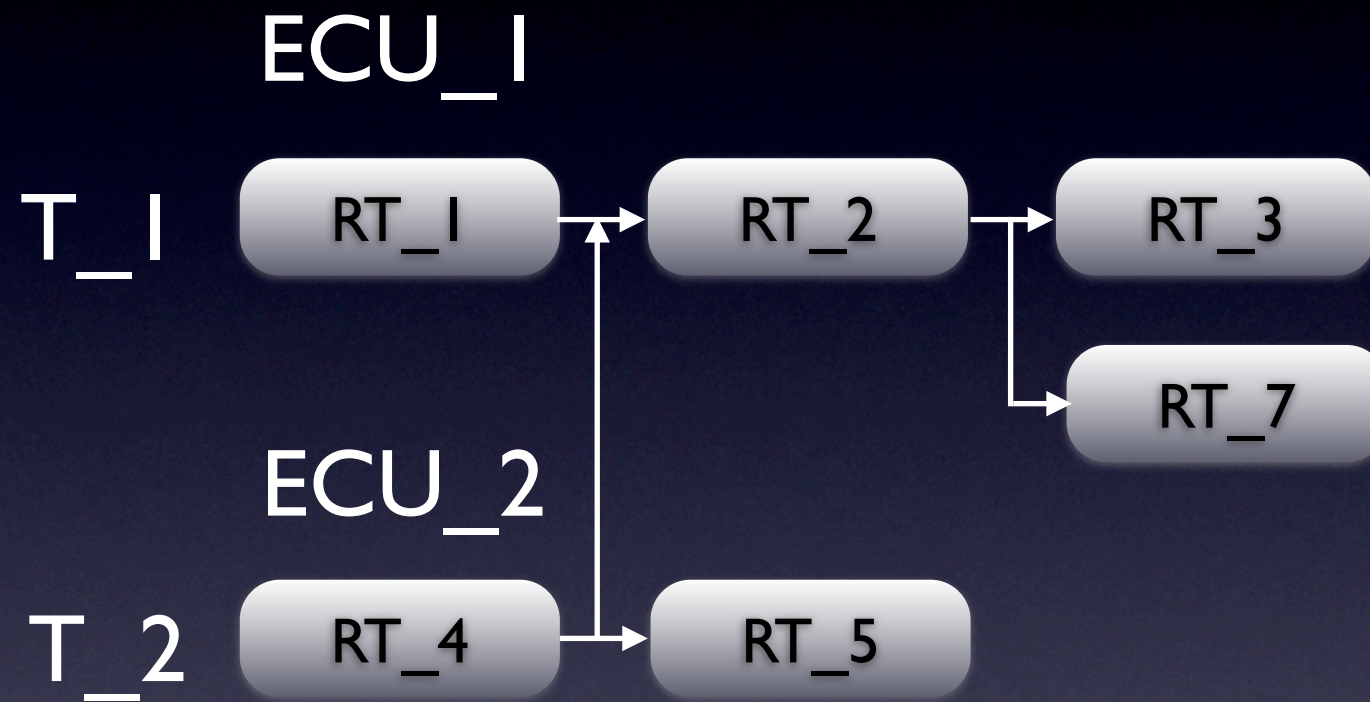
Input_Fields: "Task"

Lookup_Fields: "Task"

Output_Expression: "output = match" /* FORMAT output = match.fieldb */

Mode: Read

Commit    Add    Remove    Preferences    Help    Cancel

# Set_Event_Table, Data_Table

# Alive_Supervisor, Deadline Supervisor

# Pre-Condition Processing

## ECU_1

T_1  [ RT_1 ] → [ RT_2 ] → [ RT_3 ]

                              [ RT_7 ]

## ECU_2

T_2  [ RT_4 ] → [ RT_5 ]

## User Enters

| ID | Runnable_Task | Priority | Time | Pre_Condition | ; |
|----|---------------|----------|------|---------------|---|
| 1 | RT_1 | 0 | 1.0 | {"Evt_1"} | ; |
| 2 | RT_2 | 0 | 1.0 | {"RT_1","RT_4"} | ; |
| 3 | RT_3 | 0 | 1.0 | {"RT_2","Data_1"} | ; |
| 4 | RT_4 | 0 | 2.0 | {} | ; |
| 5 | RT_5 | 0 | 2.0 | {} | ; |
| 6 | RT_7 | 0 | 3.0 | {"RT_2"} | ; |

## Model Creates

| RT_or_Event | Triggers |
|-------------|----------|
| Evt_1 | {"RT_1"} |
| RT_1 | {"RT_2"} |
| RT_2 | {"RT_3","RT_7"} |
| RT_3 | {} |
| RT_4 | {"RT_2","RT_5"} |
| RT_5 | {} |
| RT_7 | {} |

# Summary

- WatchDog Manager can be modeled with VisualSim platform.

- WDM Alive Indications, Deadline can be processed.

- RT_n, Evt_n, Data_n pre-conditions can be processed.

- Multicore execution of RT_n can be added.

- Conversion of .xml configuration files can be added.