Program Modeling Concepts:
Lesson-8: MODELING USING GRAPHS IN MULTIPROCESSOR SYSTEMS
Application of Graphs
Multi-processor System Modeled as SDFGs unfolded into the APEGs and HSDFGs

When there is an indefinitely long data sequence, SDFG based modeling and the consequent unfolding into the HSDF and APEG graphs helps.
HSDFG

- HSDFG applied to the computations of a fast Fourier transform or for coding a voice data.

- An HSDF graph can also effectively model an IPC (Inter Processor Communication) graph.
Two-processor System Modeled as one APEG and one HSDFG with an IPC from PA to PB
Each task of function Executing on an assigned processor

(V'_1, V'_2, V'_3), and (V''_1, V''_2, V''_3) are different threads of the task 1 and task 2, respectively.
Each task or function executing on the different processors at the different periods.
Instructions of Four Different Tasks
Partitioned and Scheduled on Two processors
Instructions of Four Different Tasks Partitioned and Scheduled on Two processors differently in different periods

![Diagram of Instructions](image)
A model for partitioning all the processes running on the processors by HSDFGs and organisation of each vertex hierarchically as a tree of sub-graphs, each vertex having a nested controlling structure like a macro thread or task.
When there are too many IPCs, total performance cost increases. This cost is reduced by appropriate re-synchronisation.
Re-synchronization
Summary
We learnt

- For Multiprocessor systems, use the models are used for partitioning, load balancing, scheduling, synchronisation and resynchronisation during the program flow on the multiple processors. This gives minimum total performance costs (processing delays).
End of Lesson 8 of Chapter 6