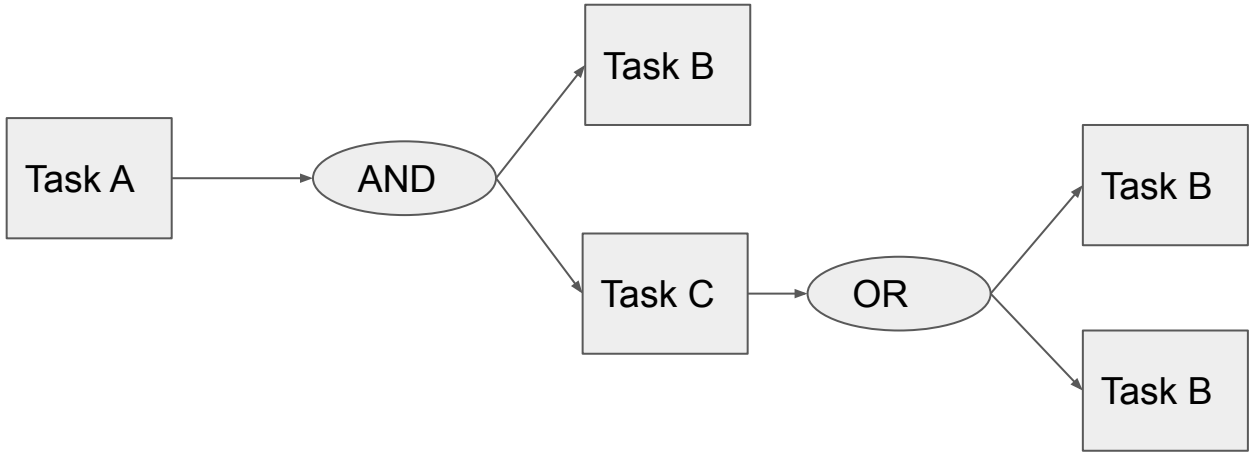
Workflows and Workflow Patterns

Workflows

This term was widely in use prior to BPMN and the use of the new term “processes”

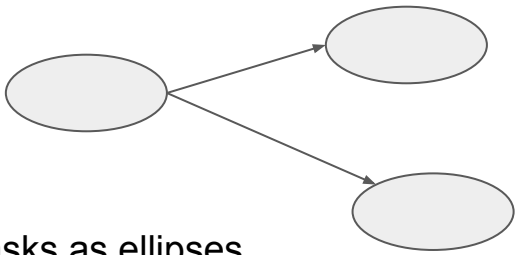
The following **notation** is one popular workflow model notation: **boxes, ellipses (connector nodes), and flow lines**



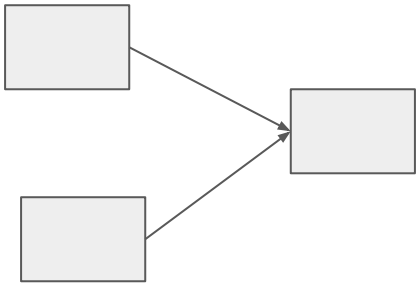
Other workflow notations

UML activity diagrams have also been used – on next slide

Or people have used just the network of tasks without using special connectors



Tasks as ellipses



Tasks as boxes

Basic Notation of the Activity Diagram

Initial Node	A black circle is the standard notation for an initial state before an activity takes place. It can either stand alone or you can use a note to further elucidate the starting point.
Activity Activity	The activity symbols are the basic building blocks of an activity diagram and usually have a short description of the activity they represent.
Control Flow	Arrows represent the direction flow of the flow chart. The arrow points in the direction of progressing activities.
Branch	A marker shaped like a diamond is the standard symbol for a decision. There are always at least two paths coming out of a decision and the condition text lets you know which options are mutually exclusive.
Fork	A fork splits one activity flow into two concurrent activities
Join	A join combines two concurrent activities back into a flow where only one activity is happening at a time.
	The final flow marker shows the ending point for a process in a flow. The difference between a final flow node and the end state node is that the latter represents the end of all flows in an activity.
Complete Activity Flow	The black circle that looks like a selected radio button is the UML symbol for the end state of an activity. As shown in two examples above, notes can also be used to explain an end state.
Notes	The shape used for notes.

Typical workflow model characteristics

Single role type, are to be made separately for each role

No messages between tasks

Primarly composed of tasks and different types of branching connectors

Richness of BPMN is absent

Were/are okay for small standalone task workflows, but not sufficient for modern complex multi-party processes

A typical workflow model from research papers

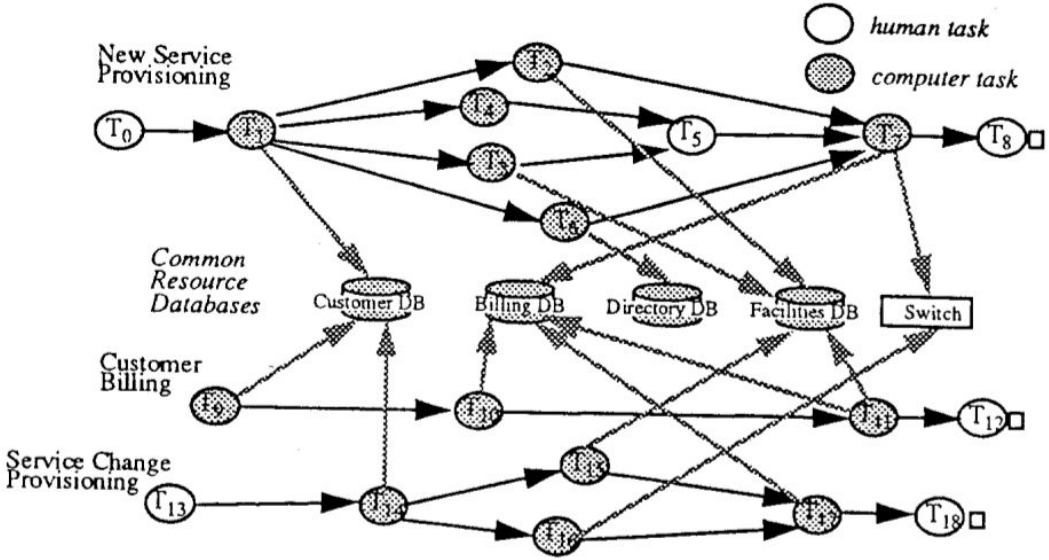


Figure 2. Telecommunication workflows.

A typical workflow model from research papers

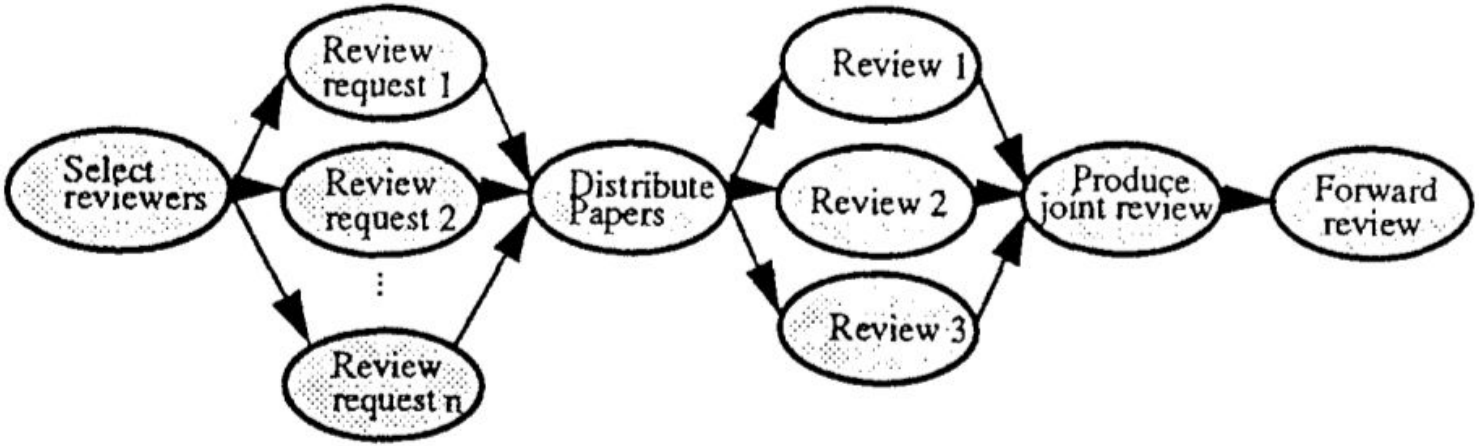


Figure 3. Ad hoc paper review workflow.

A typical workflow model from research papers

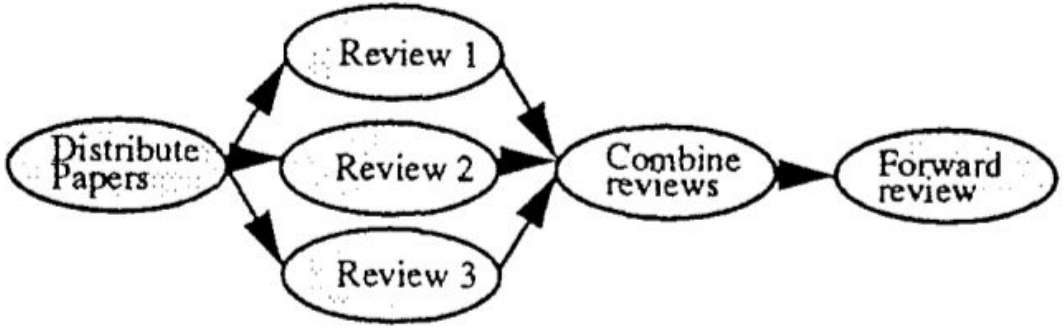


Figure 4. Administrative paper review workflow.

A typical workflow model from research papers

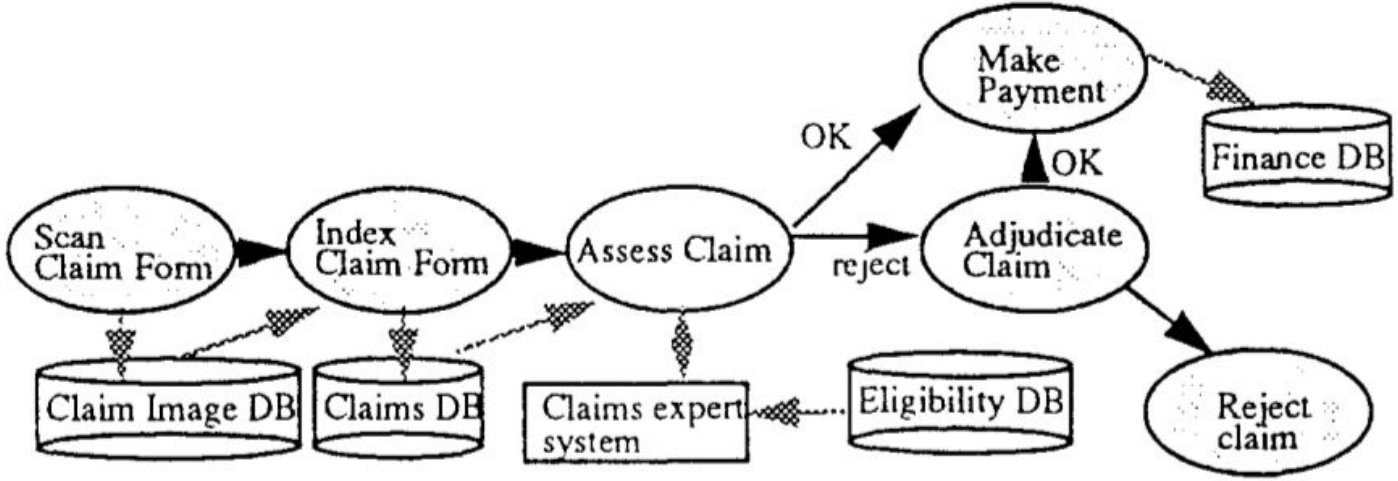


Figure 5. "Health claims process" workflow.

Reference paper for previous 4 models:

Distributed and Parallel Databases, 3, 119–153 (1995)

An Overview of Workflow Management: From Process Modeling to Workflow Automation Infrastructure

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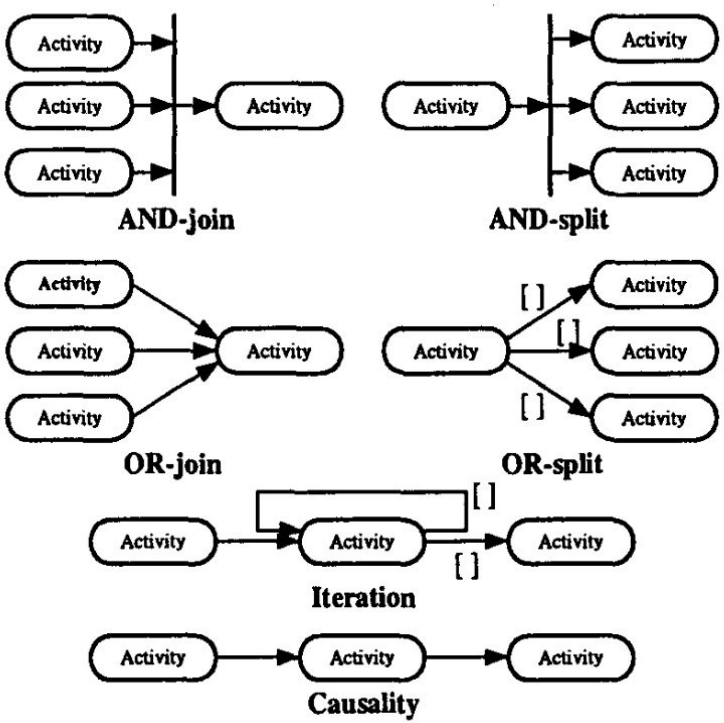
Recommended by: Omran Bukhres and e. Kühn

A typical workflow model from research papers: use of UML activity model



A typical workflow model from research papers: UML activity model

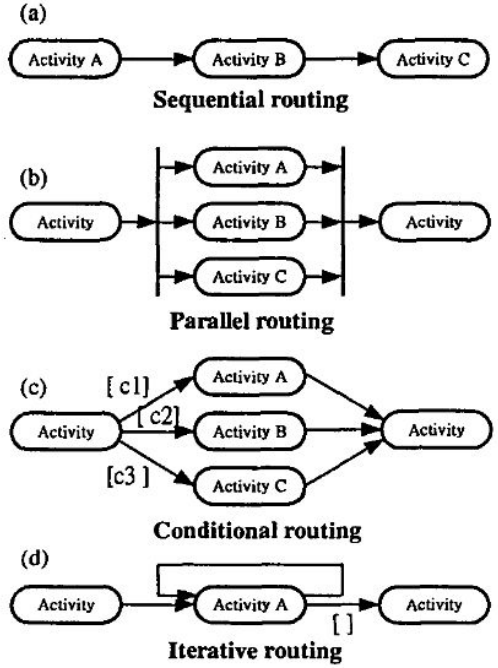


Figure 4. Process routing presented by workflow primitives

A typical workflow model from research papers: UML activity model

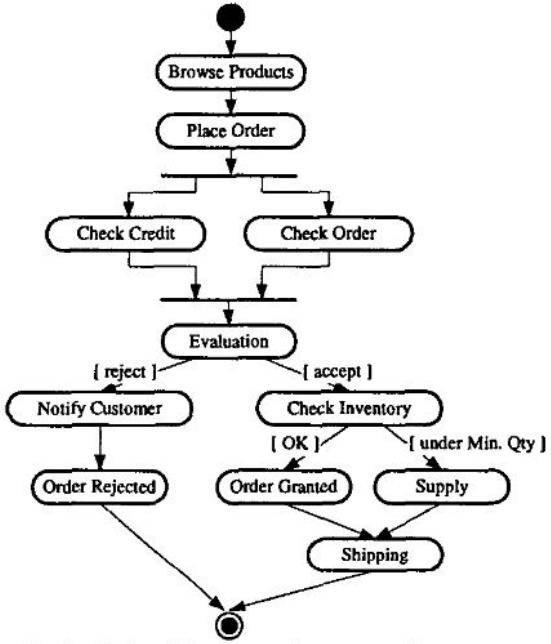


Figure 5. Activity diagram for an order processing flow

Reference research paper for the previous three models:

Workflow Process Definition and Their Applications in e-Commerce

Yen-Liang Chang[1], Sammy Chen[2], Chyun-Chyi Chen[1], Irene Chen[3]
[1]*National Central University, CSIE, Taiwan*
[2]*Software Methodology Laboratory of Academia Sinica*
[3]*Hsing Kuo University*
E-mail : chang@se01.csie.ncu.edu.tw

Primitive Patterns.. A recap

Sequence -- one after another

Exclusive choice or XOR Split -- only one of many/ switch/ decision

XOR Join or **simple merge**

-- wait for that chosen one from split, to arrive at join and finish

Parallel split (AND) -- do all branches, each exactly once

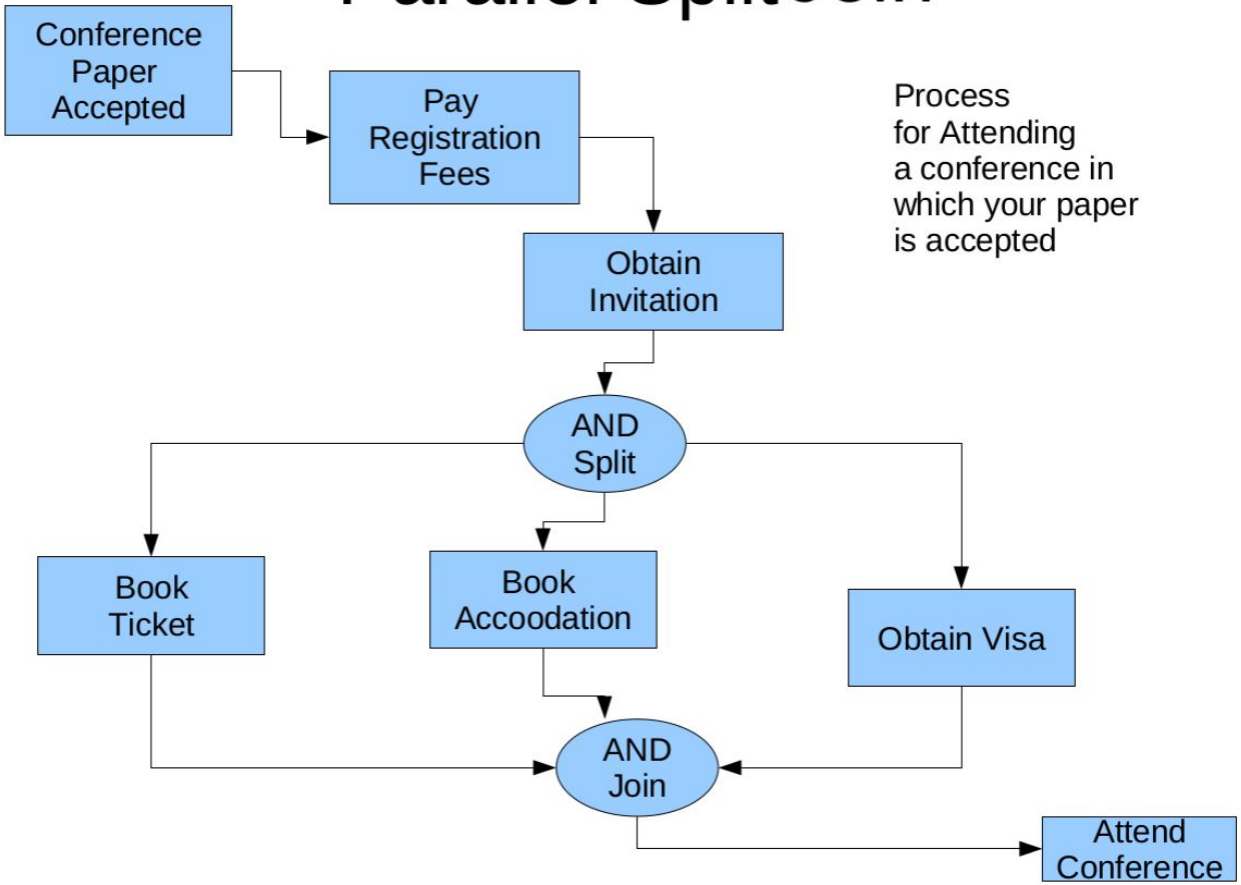
Parallel (AND) Join or also called **Synchronization**

- each branch executes only once.

Sequence

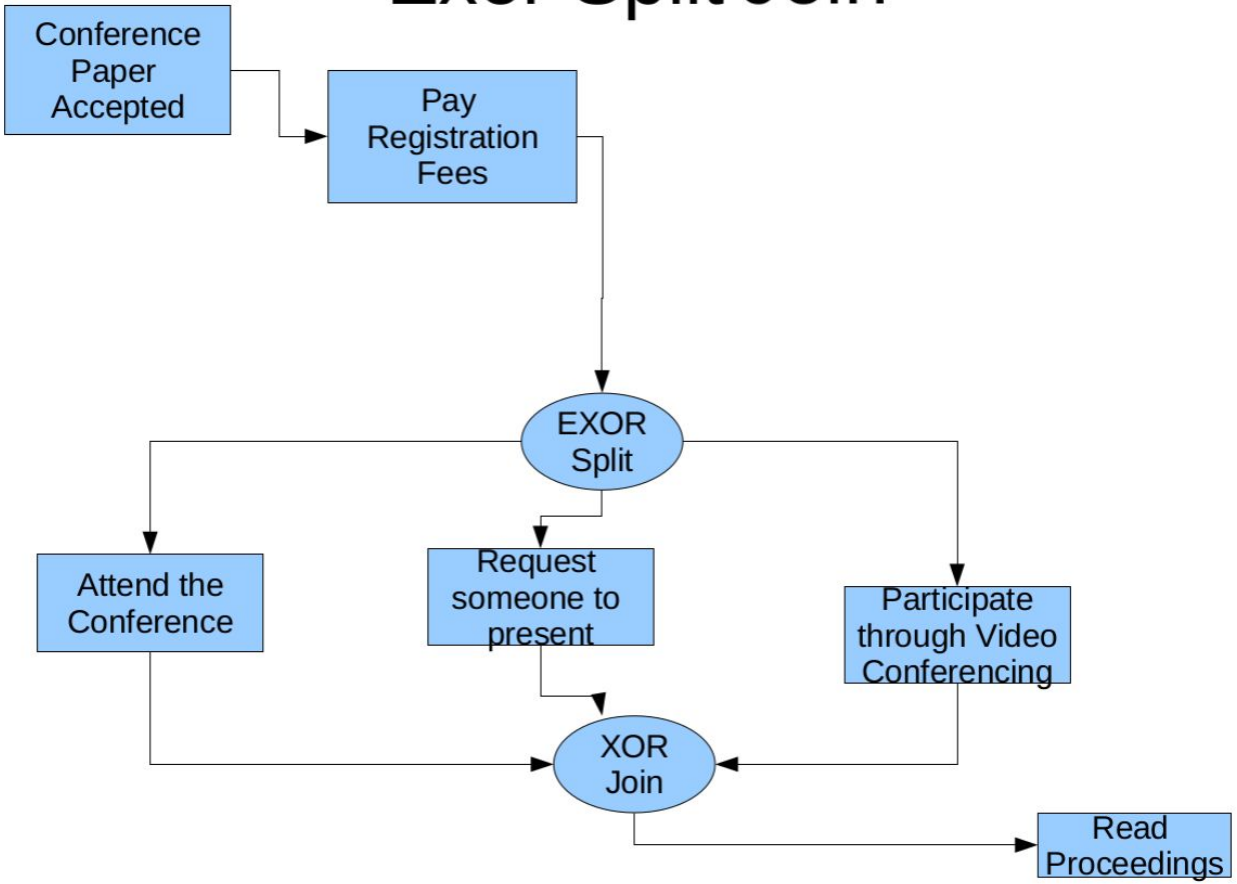
The Process of Applying for Extension to DDP/MTP/BTP

Parallel Split Join

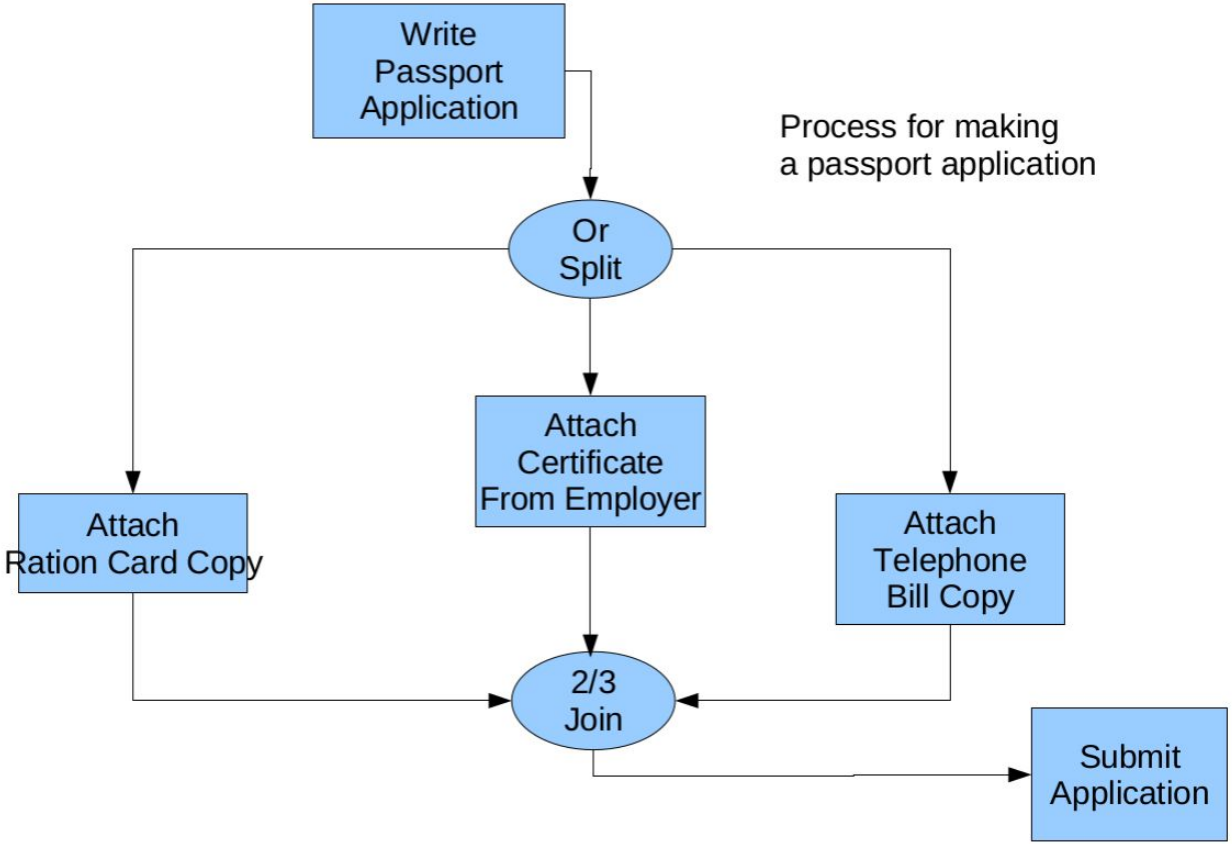


Process for Attending a conference in which your paper is accepted

Exor Split Join



Branch and N/M Join



Multi-choice (a type of forking/branching/splitting)

Multiple branches may get chosen

Example:

x<A: branch b1, x>B: branch b2

How many possible branches are there in the design?

One can make different designs for this multi-choice branching,

Try Petri Net based Design

Possibilities: both b1, b2; or only b1; or only b2; or neither!

Also how would you merge?

Synchronizing merge

Usable for multi-choice

Needs to synchronize when all branches are chosen in split

If only one branch was chosen, it acts as merge

One needs to know what was done in split

Try out a petri net!

Workflow engines may implement it by passing false tokens through branches not taken, and using synchronization at the join point.

Multi-merge

When two branches meet without needing synchronization

For example: traces A B D E and A C D E, B and C are two branches, and they need not wait for each other to complete

Use And split, but merge join..

Or

Use and split and no join but redundant tasks D and E

Discriminator

Wait for one of the incoming branches to complete and then go ahead

Later, other branches may complete but they are ignored

Useful in redundant computations for reliability\

Try out!