

# Une approche par composants pour l'analyse visuelle interactive de résultats issus de simulations numériques

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Séminaire LINA

5 mai 2014

- ▶ **ExaVIZ** : Exa-scalable visual analysis for life and materials sciences
- ▶ Visualisation scientifique interactive
- ▶ Architecture et modèle par composants



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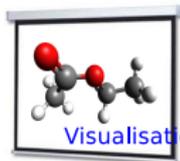
Interaction



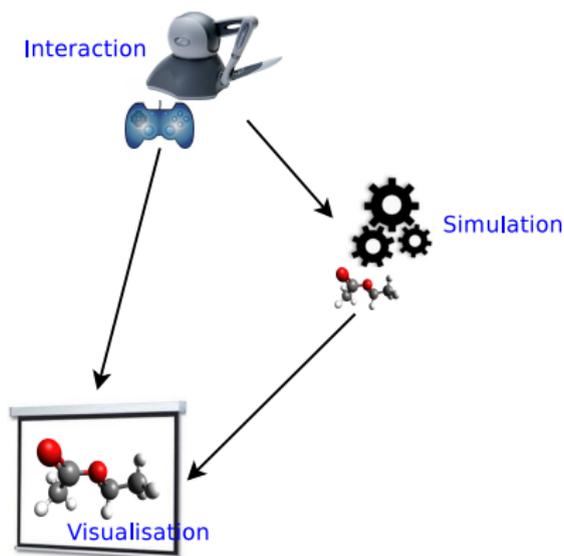
Simulation



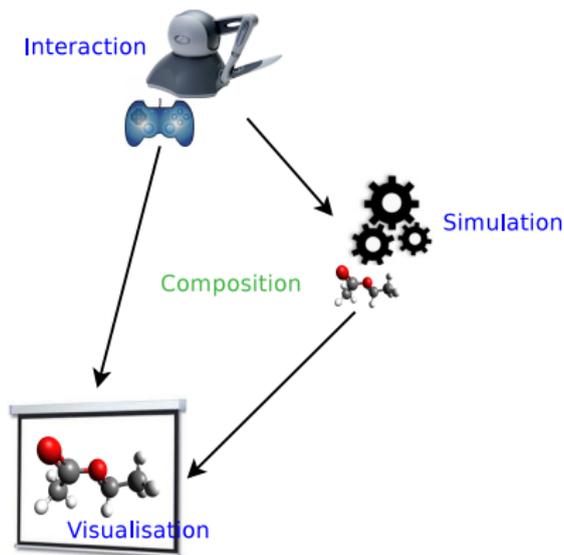
Visualisation



- ▶ **ExaVIZ** : Exa-scalable visual analysis for life and materials sciences
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- ▶ **Component-based approach for Scientific Applications (ComSA)** : respecter les caractéristiques précises des applications de visualisation scientifique interactives
- ▶ Extension d'un modèle existant : Amélioration et définition des nouveaux objets
- ▶ Modélisation des ces applications par une sous classe des réseaux de Petri colorés et les réseaux FIFO : Réseau FIFO coloré strict (sCFN)
- ▶ Reconfiguration dynamique de ComSA

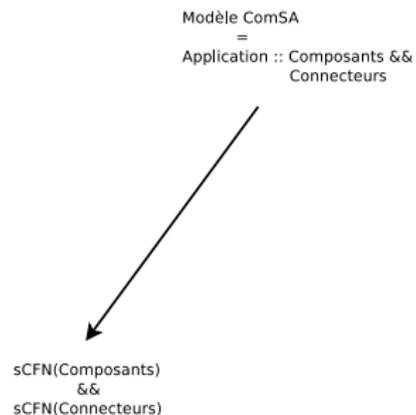
# Modèle par composants ComSA

Modèle ComSA

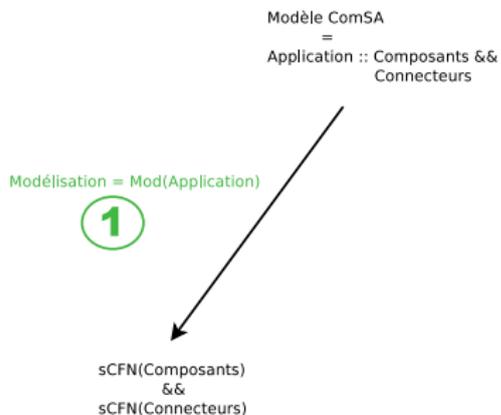
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Application :: Composants &  
Connecteurs

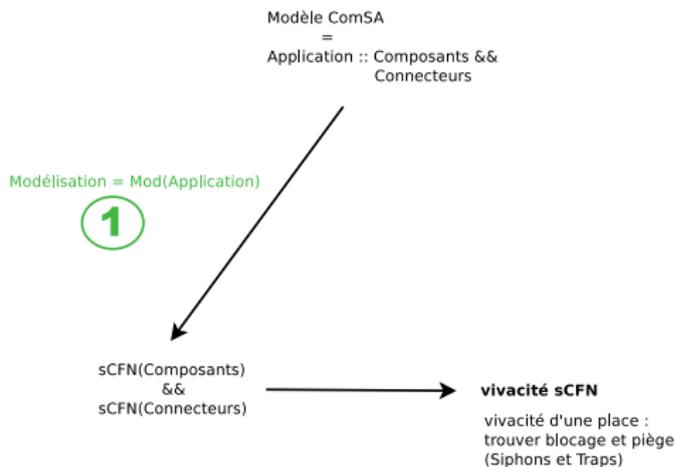
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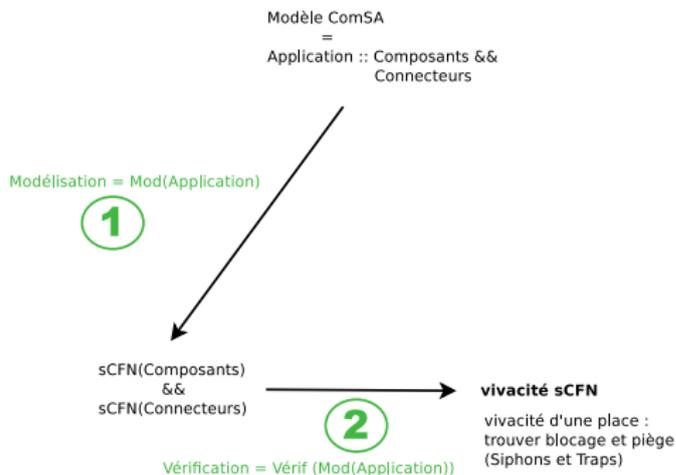
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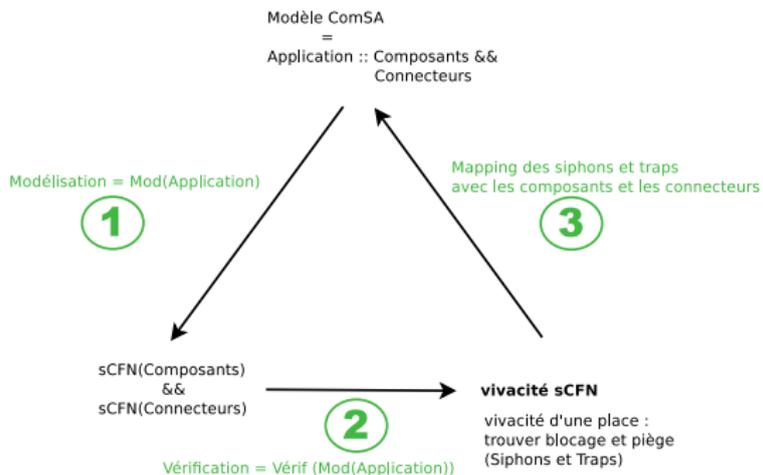
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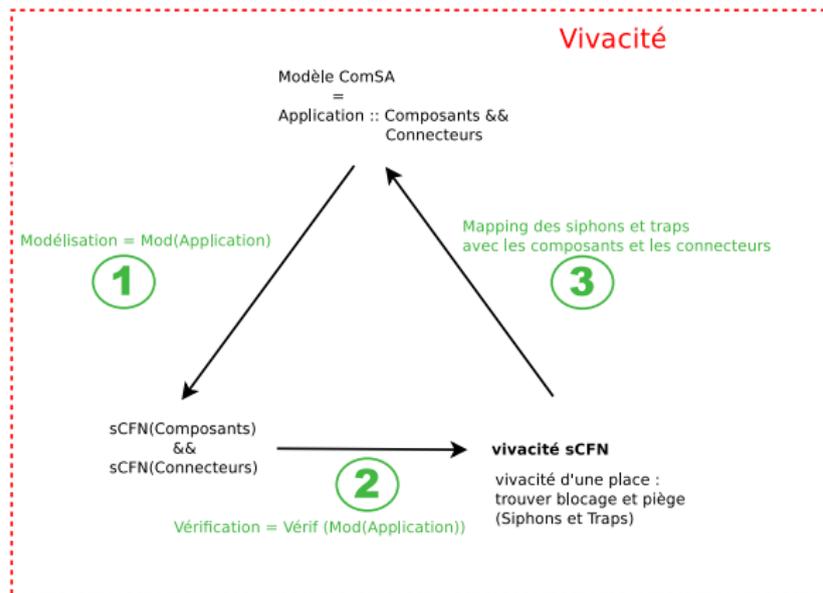


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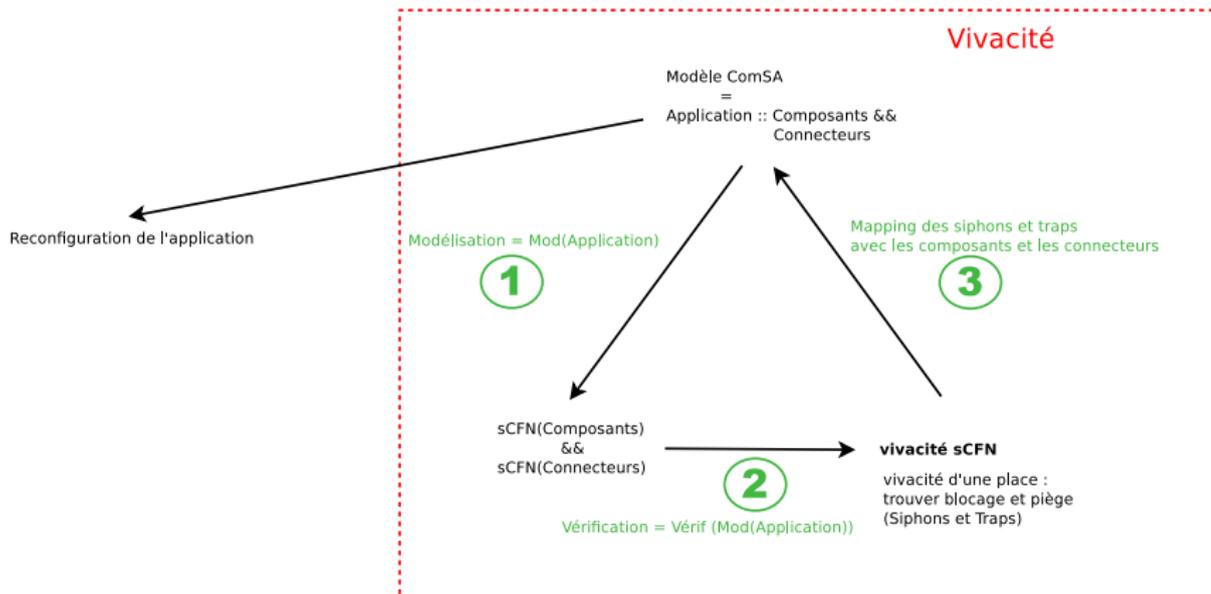


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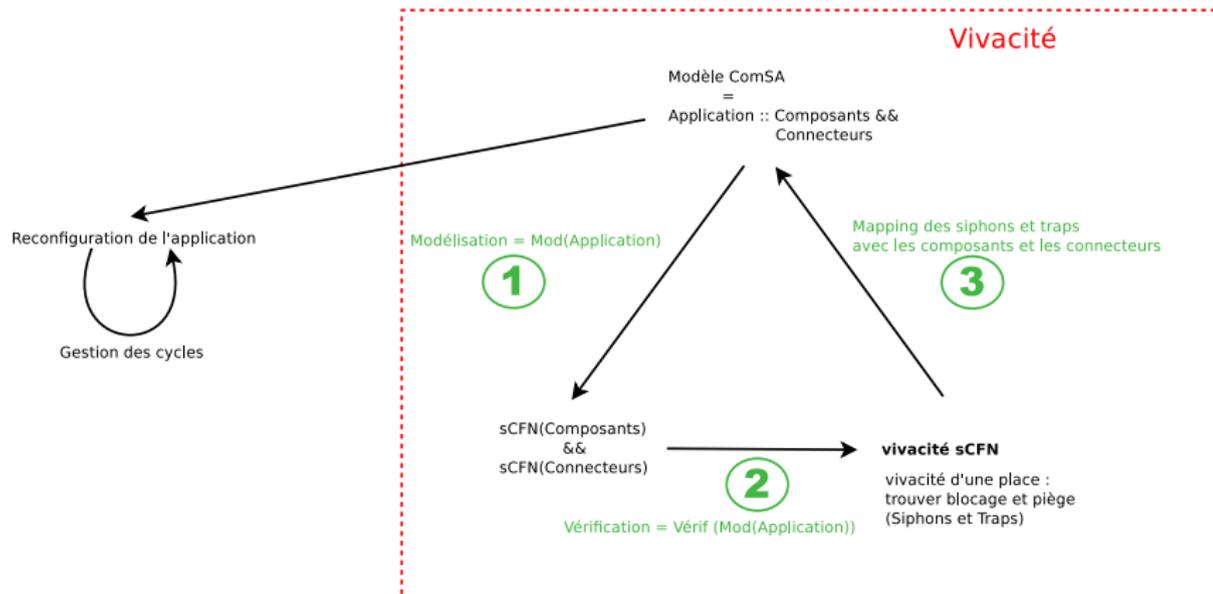




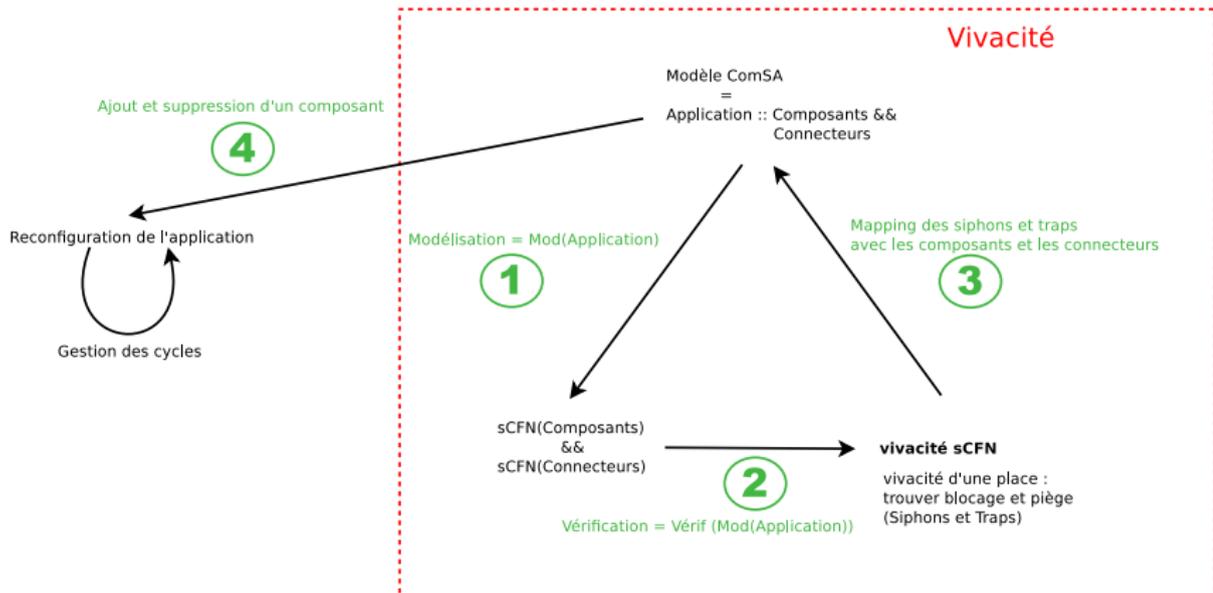
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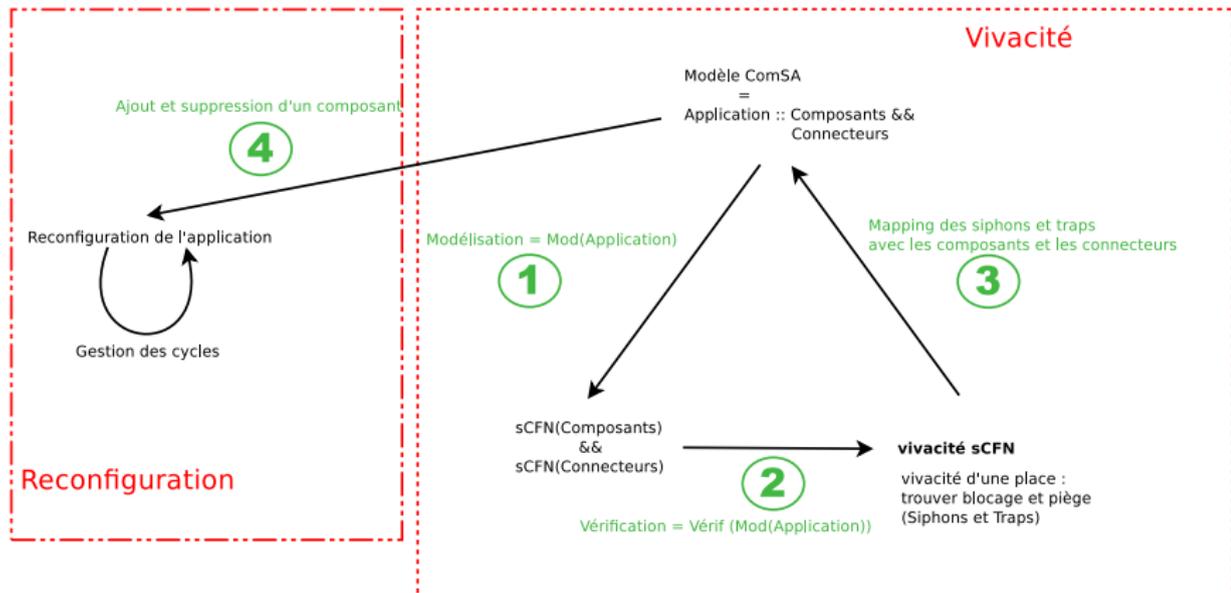
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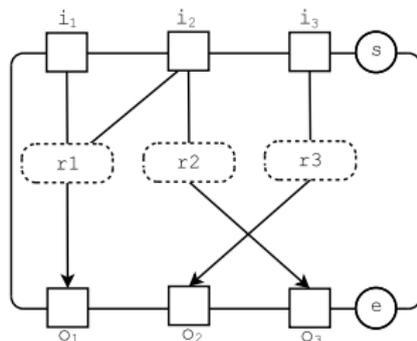


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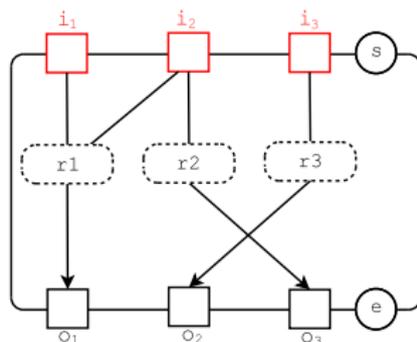
Un **composant** est un quadruplet :

$$C = (Id, pIn_C \cup \{s\}, pOut_C \cup \{e\}, RI_C)$$
$$r = \langle RI^{in}, RI^{out} \rangle \text{ avec } r \in RI_C$$



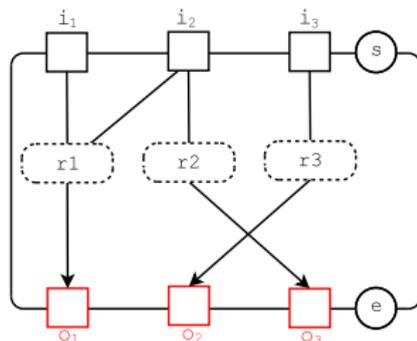
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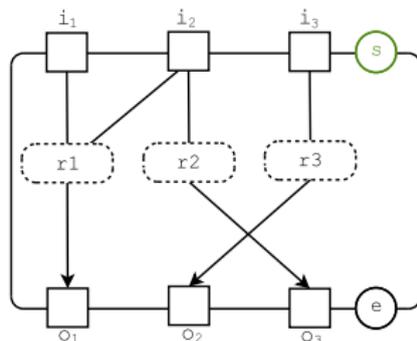
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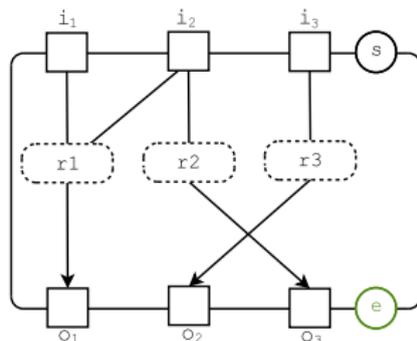
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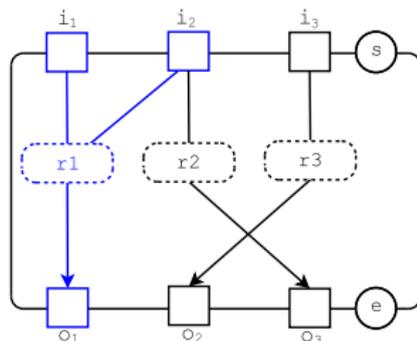
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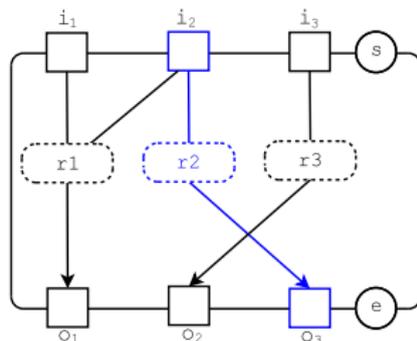
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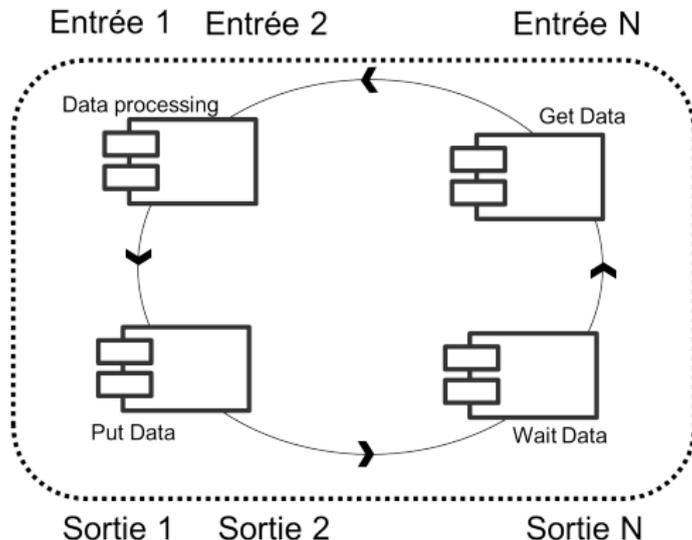
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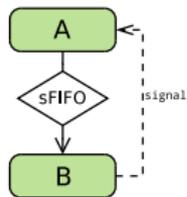


Un **connecteur** est un quadruplet :

$$conn = (Id, \{i, s\}, \{o\}, t)$$

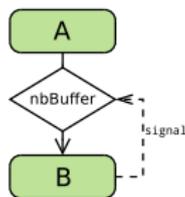
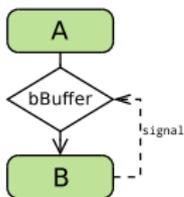
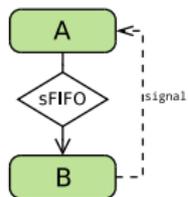
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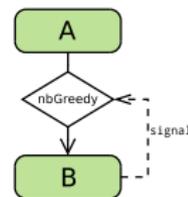
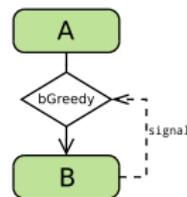
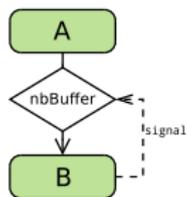
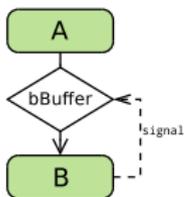
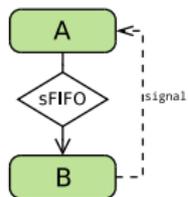
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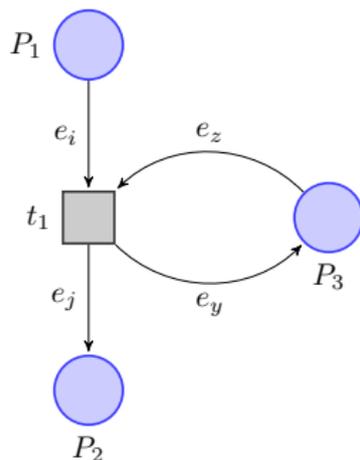
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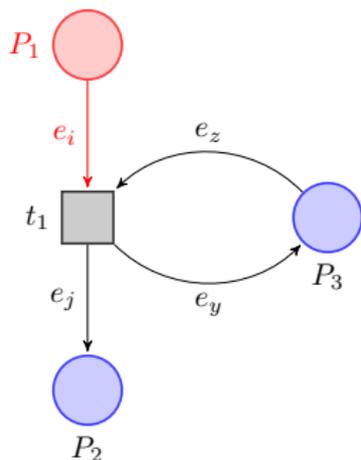
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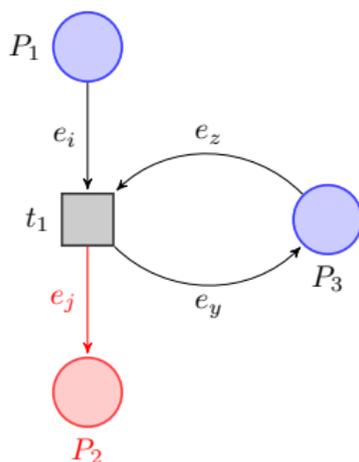




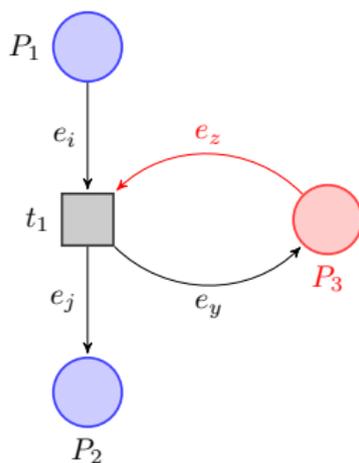
Réseau FIFO coloré strict



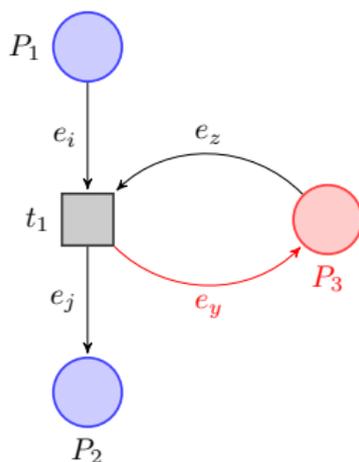
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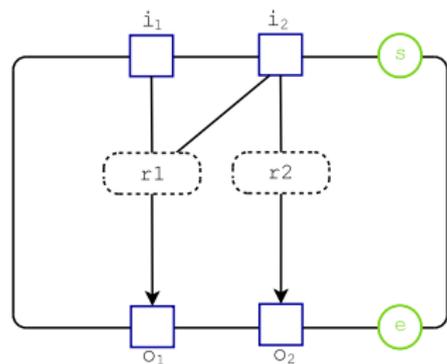


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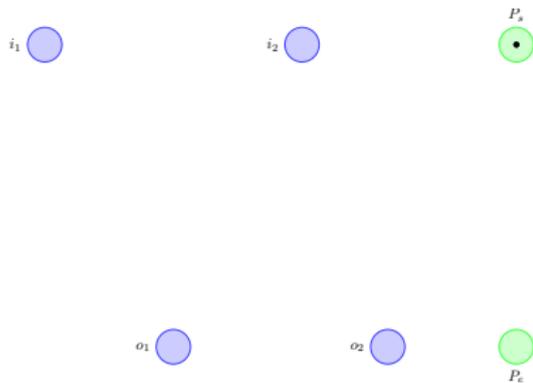
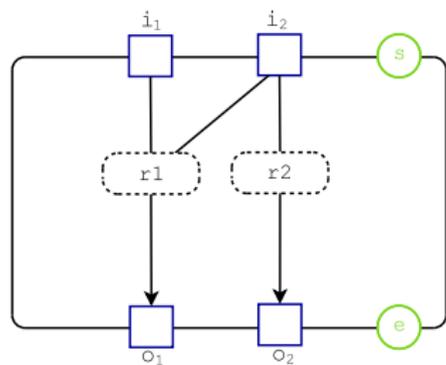


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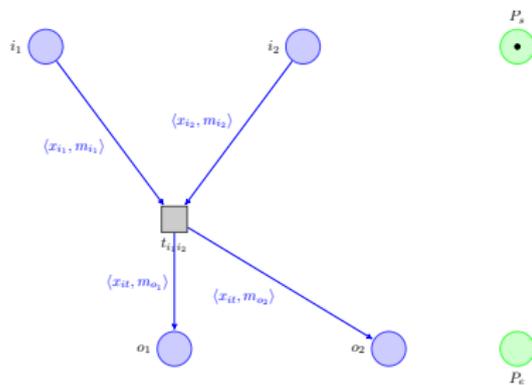
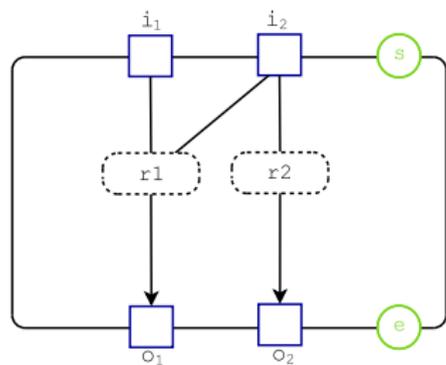
# Modélisation de ComSA : composants



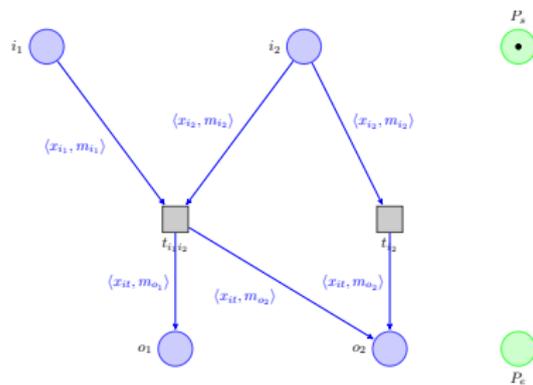
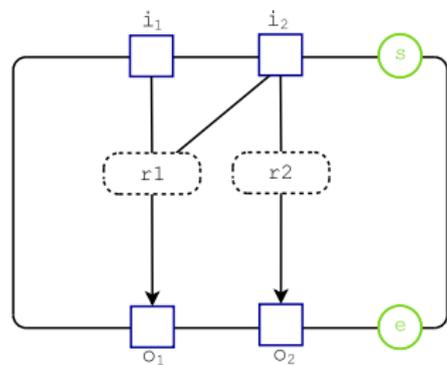
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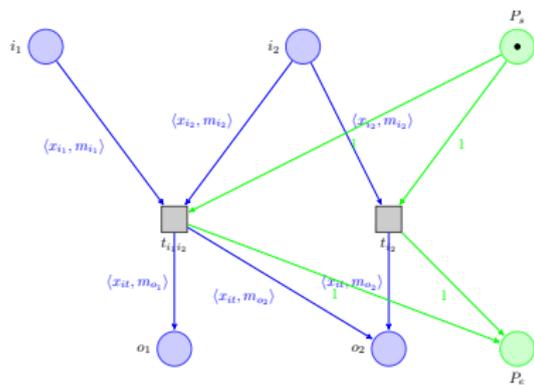
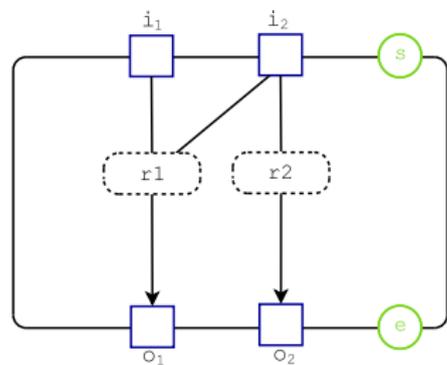
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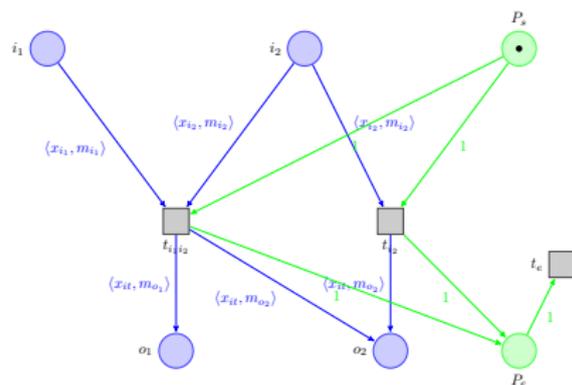
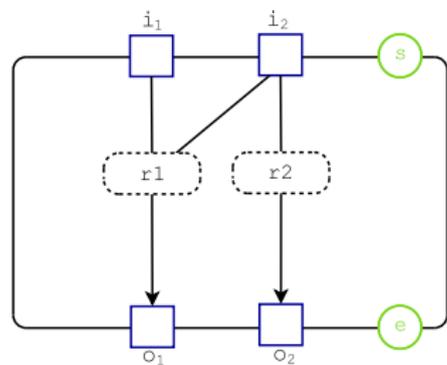
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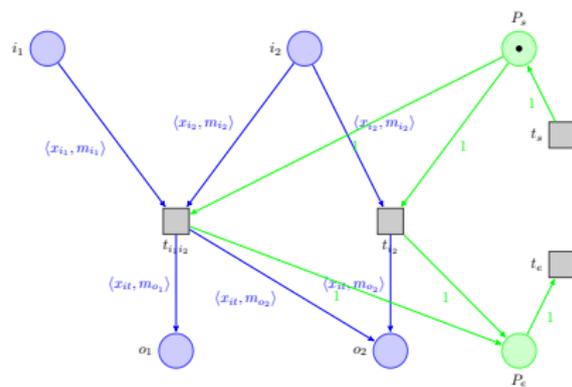
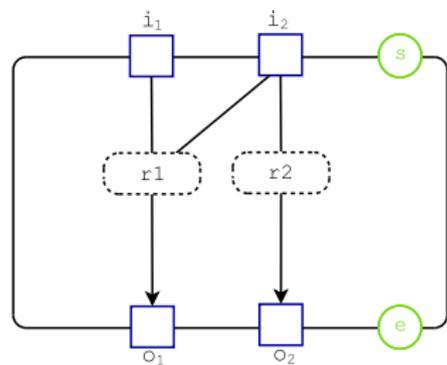
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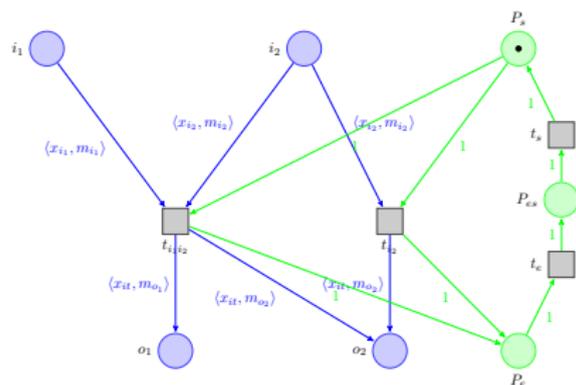
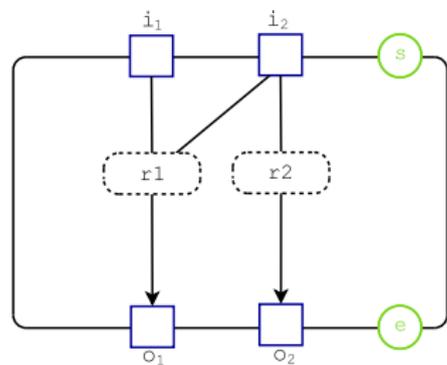
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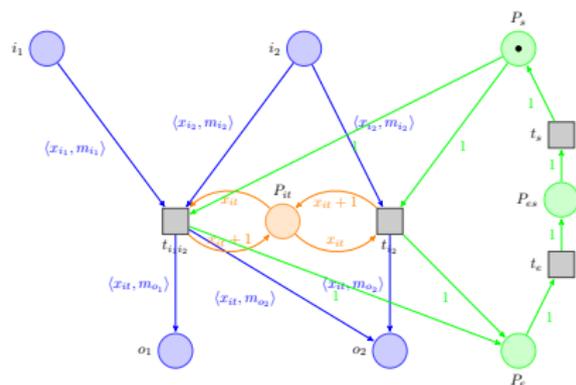
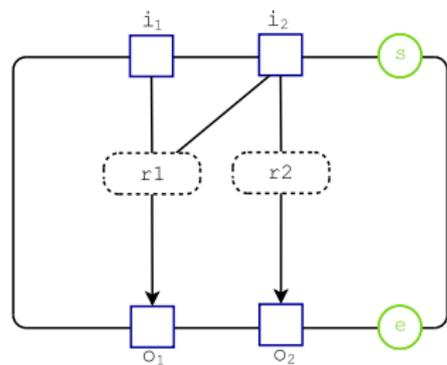


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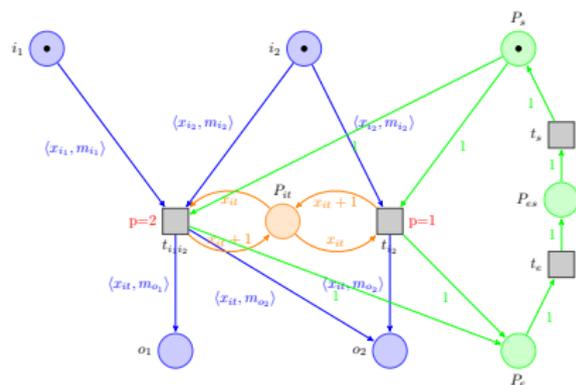
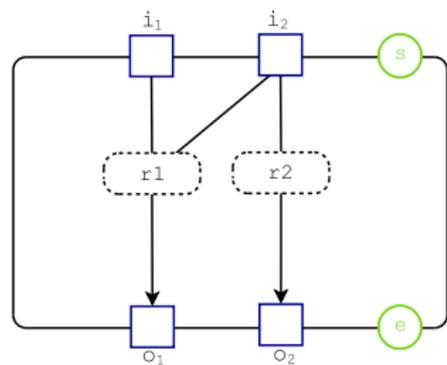


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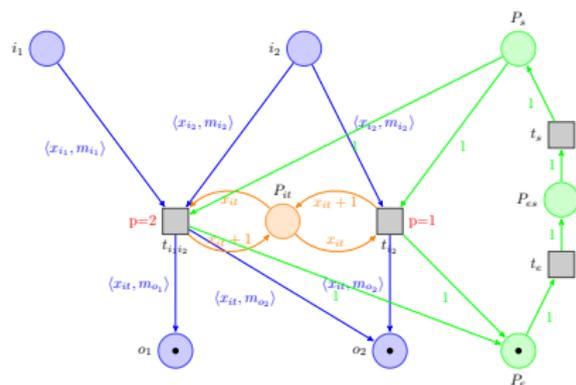
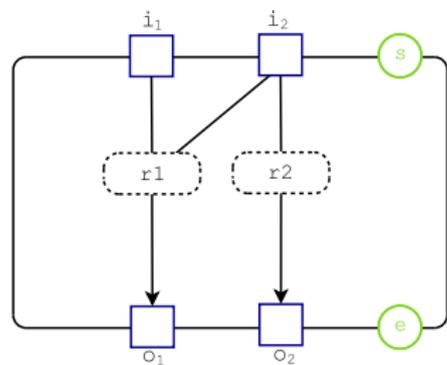




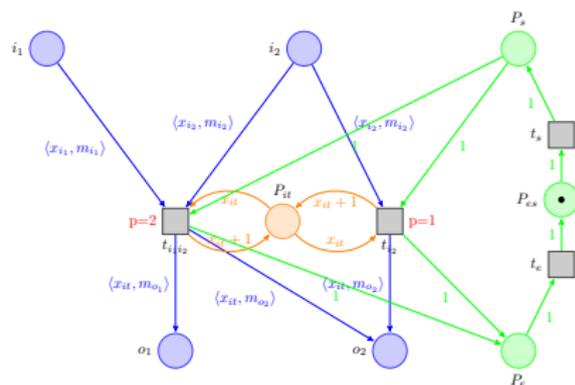
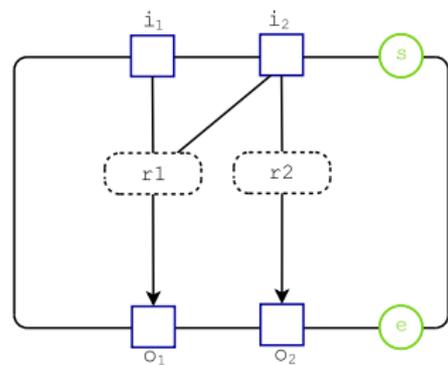
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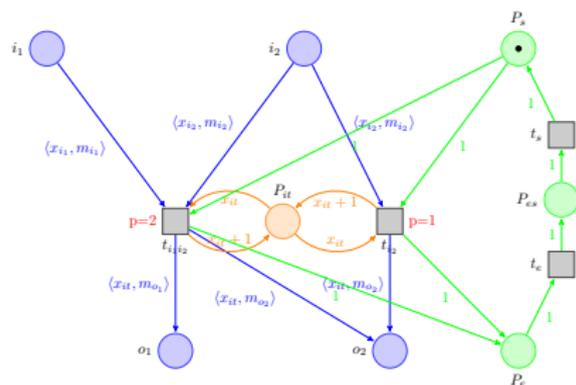
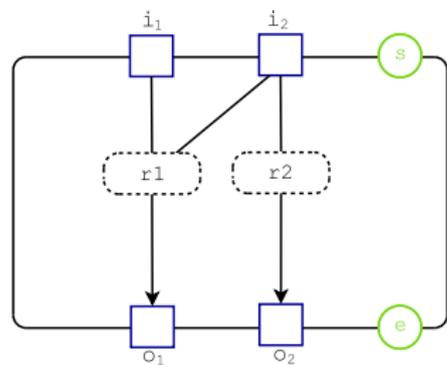
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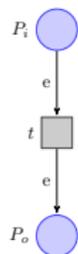
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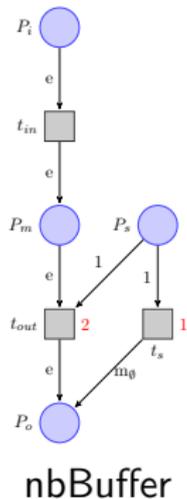
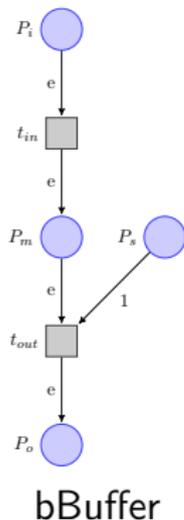
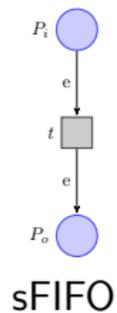




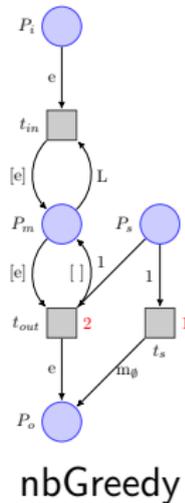
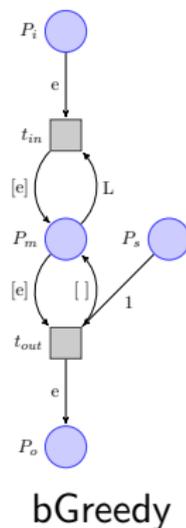
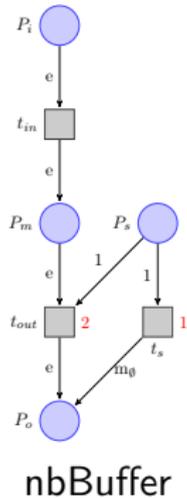
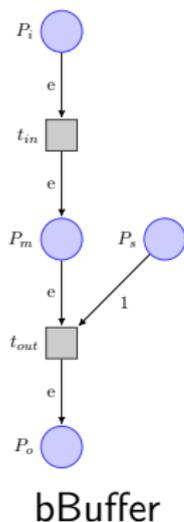
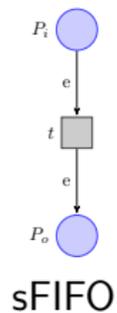


sFIFO

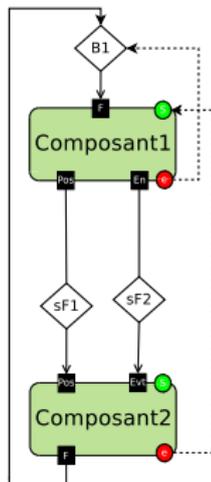
# Modélisation de ComSA : connecteurs



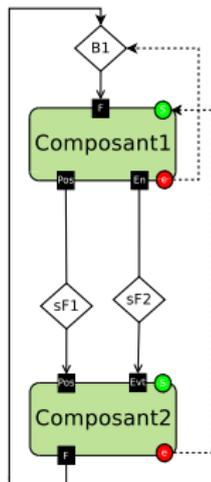
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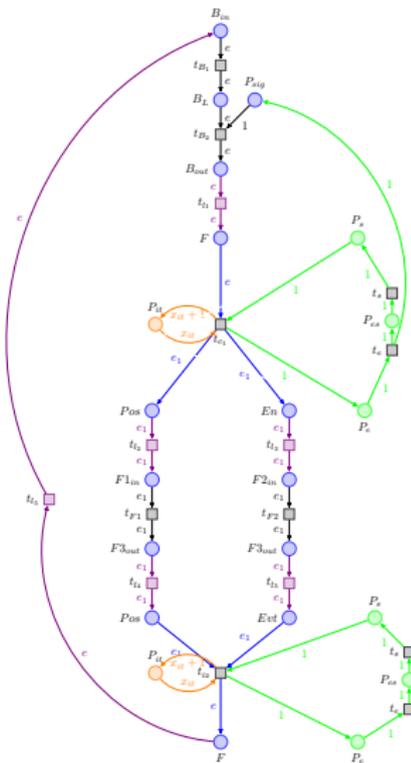
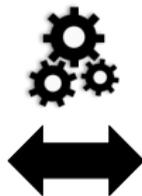
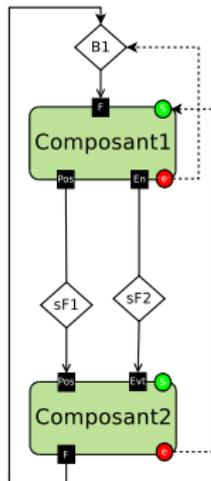
# Modélisation de ComSA : graphe d'application



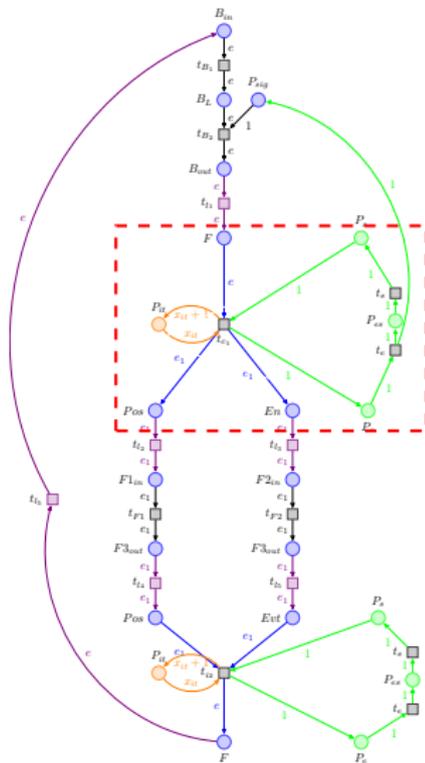
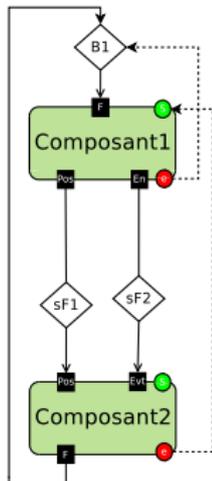
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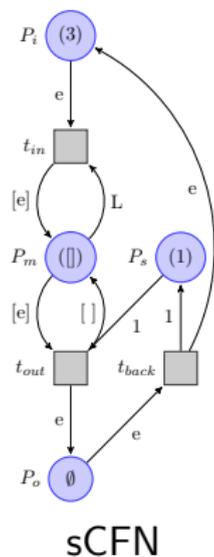


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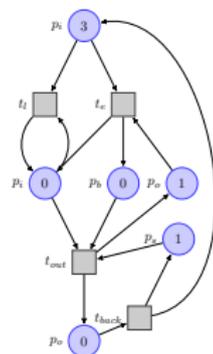
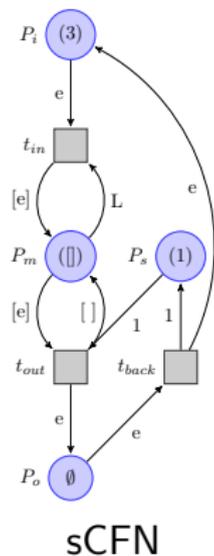




# Vérification de la vivacité de ComSA

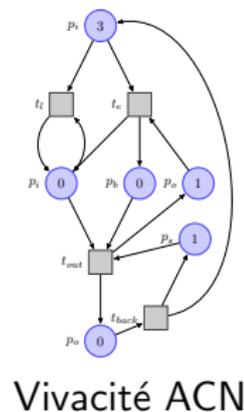
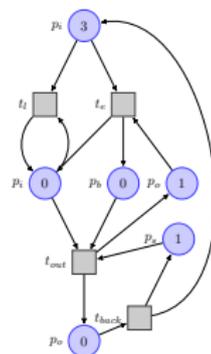
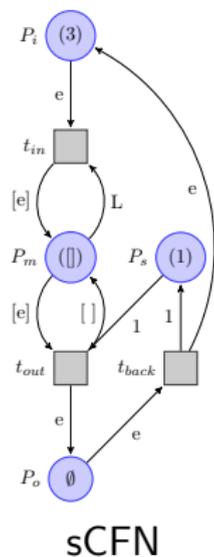


# Vérification de la vivacité de ComSA



Simulation du sCFN

# Vérification de la vivacité de ComSA



La **place vivacité** dans sCFN :

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- ▶ Sous ensemble de places  $P$  est un siphon :

$$\bullet P \subseteq P \bullet$$

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$$P \bullet \subseteq \bullet P$$

Est ce qu'il existe un siphon  $D$  qui contient un piège (trap) non marqué ?

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- ▶ L'ensemble  $P$  des places est un siphon

$$\bigvee_{p \in P} p^{(0)} \wedge \bigwedge_{t \in T} \bigwedge_{p \in \bullet t} (p^{(0)} \implies \bigvee_{p' \in \bullet t} p'^{(0)})$$

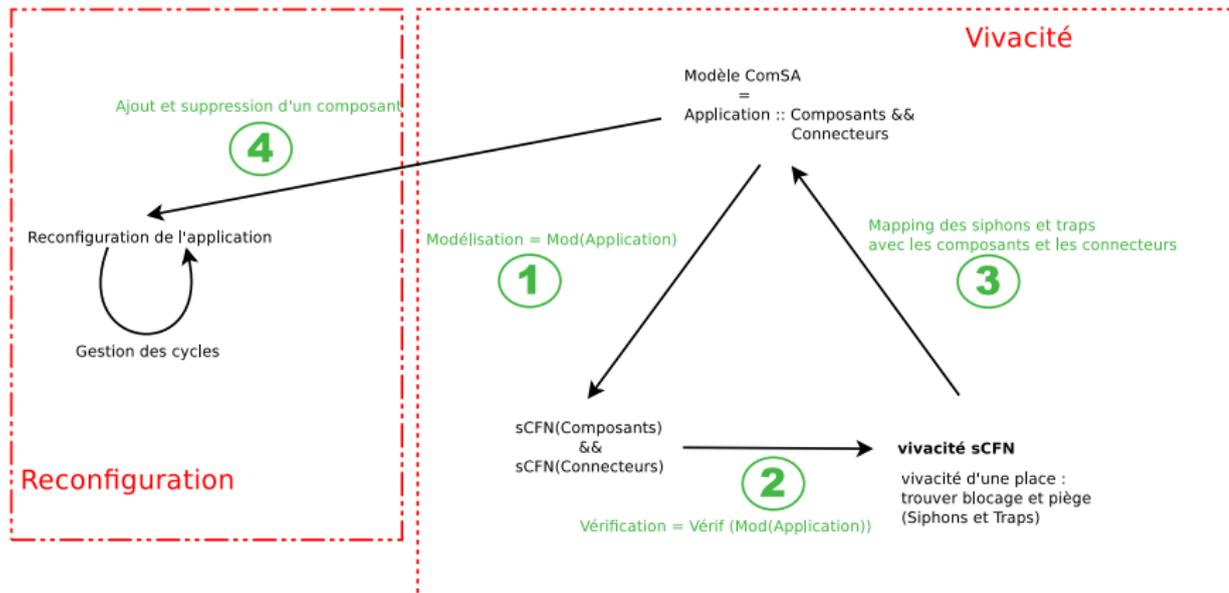
- ▶ Max-trap  $\subseteq$  siphon ?

$$\bigwedge_{i=0}^n \bigwedge_{p \in P} (p^{i+1} \iff (p^{(i)} \wedge \bigwedge_{t \in T} \bigwedge_{p \in \bullet t} \bigvee_{p \in \bullet t} p^{(i)}))$$

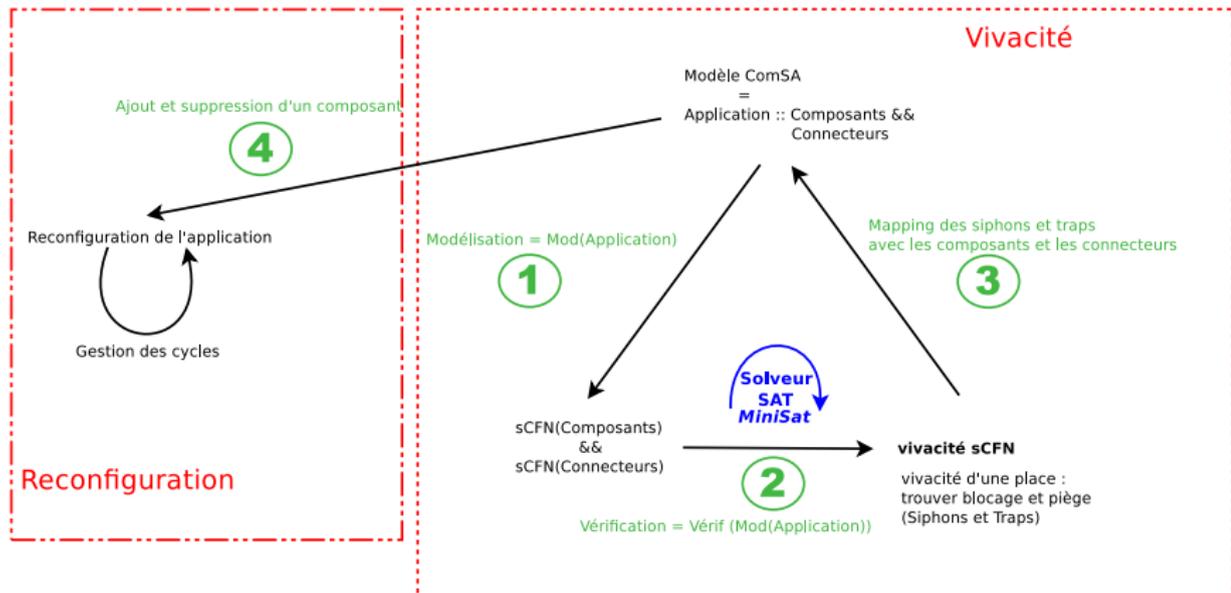
- ▶ Max-trap est non marqué ?

$$\bigvee_{p \in P: m_0(p) > 0} \neg p^{(n+1)}$$

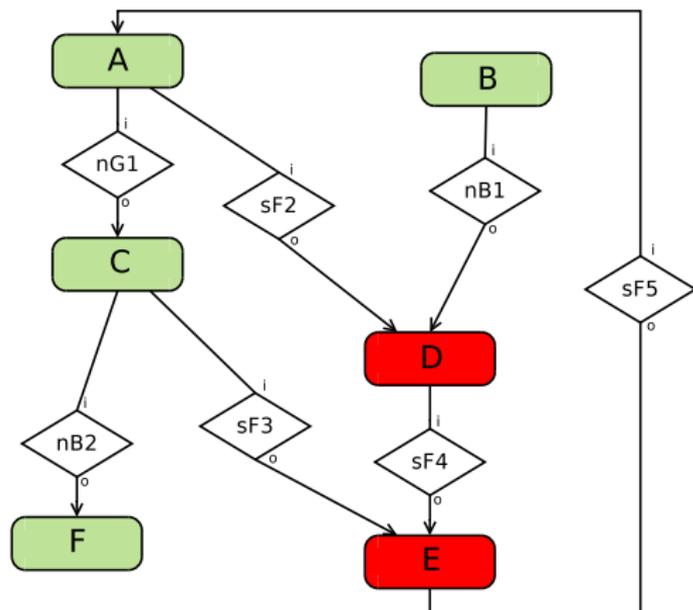
# Modèle par composants ComSA



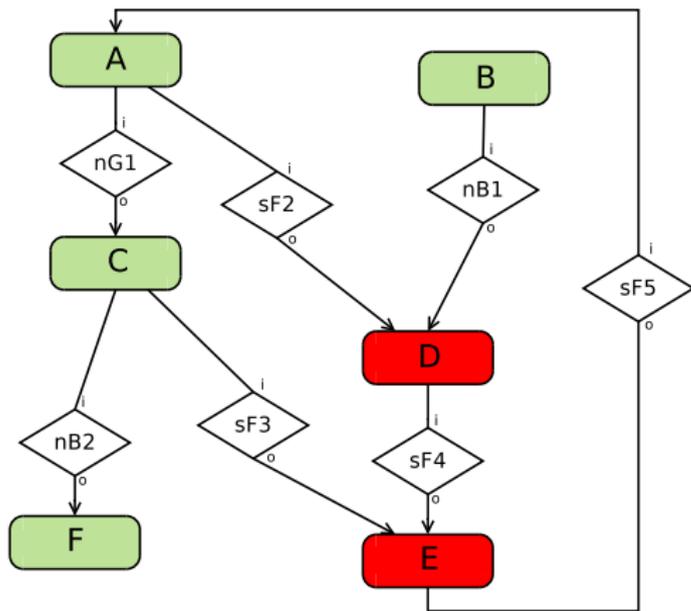
# Modèle par composants ComSA



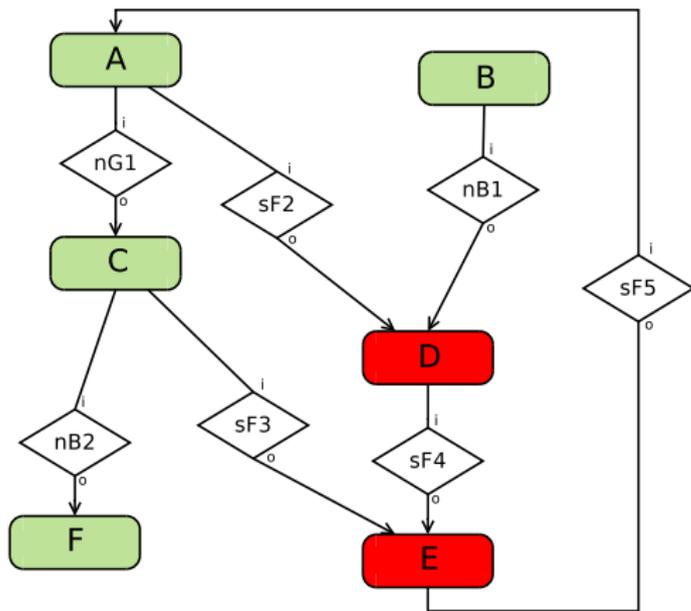
# Reconfiguration



# Reconfiguration

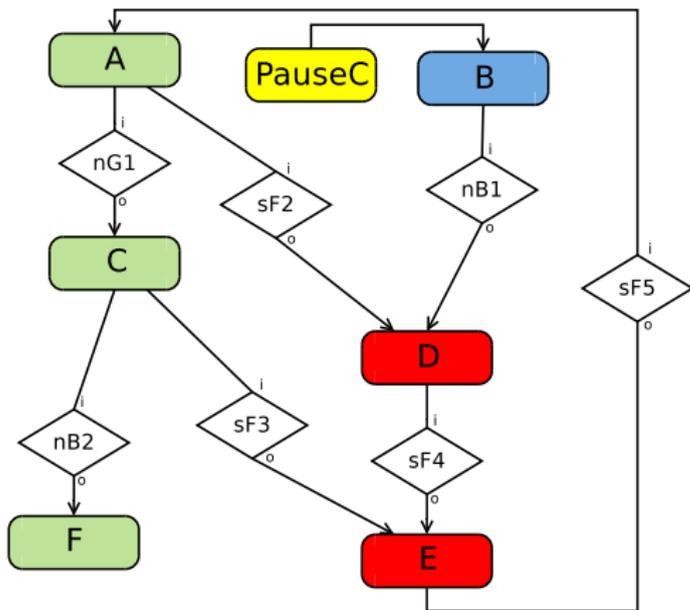


- ▶ Insertion entre composant D et E
- ▶ Parcourir tous les chemins de RI en descendant à partir le composant E :  
Si bGreedy v bBuffer alors Remove(TI)



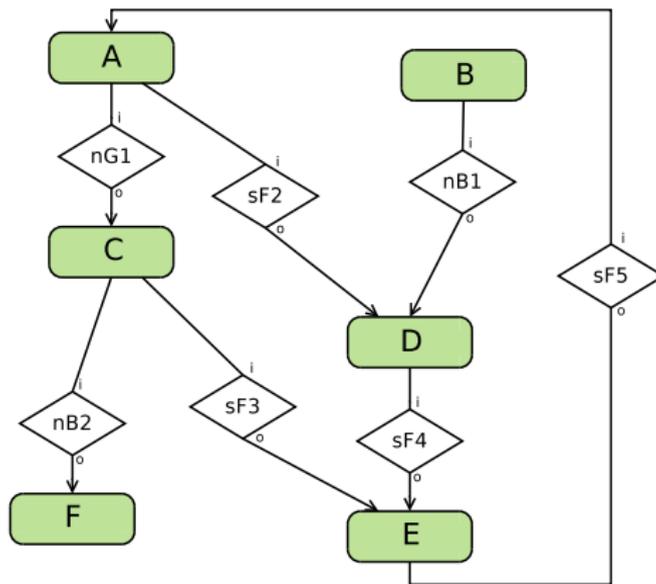
- Parcourir tous les chemins de RI en montant à partir le composant D :  
Si nbBuffer  $\leq$  bBuffer  
v sFifo alors  
Remove(TI)

# Reconfiguration

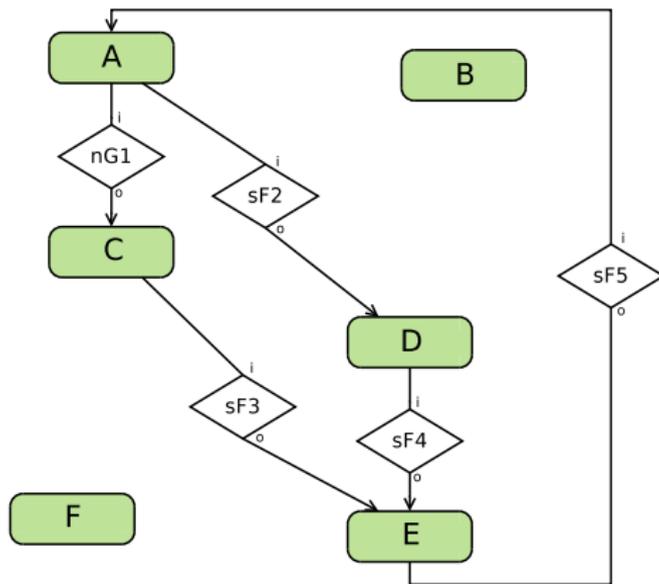


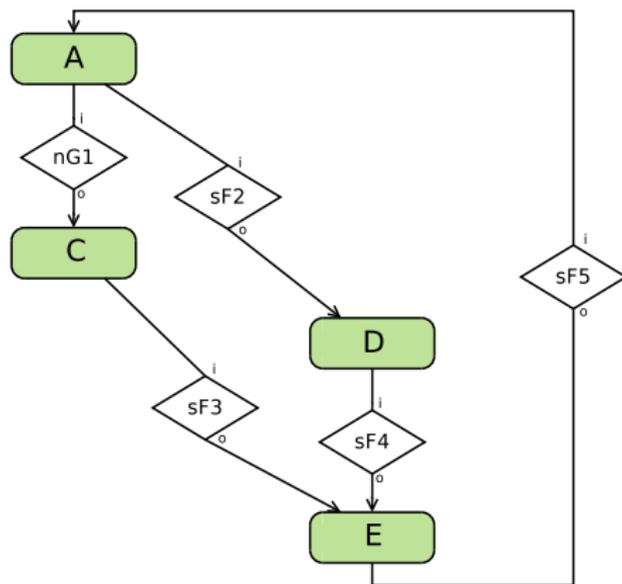
- ▶ Si le composant producteur n'a pas de Input : pauseC

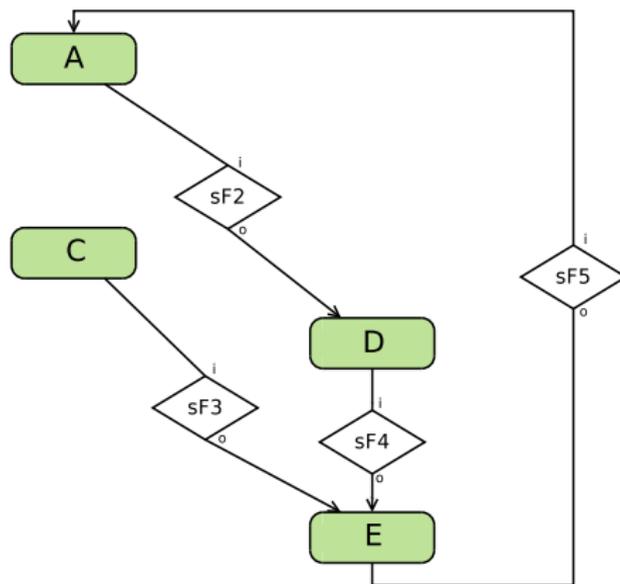
# Gestion des cycles

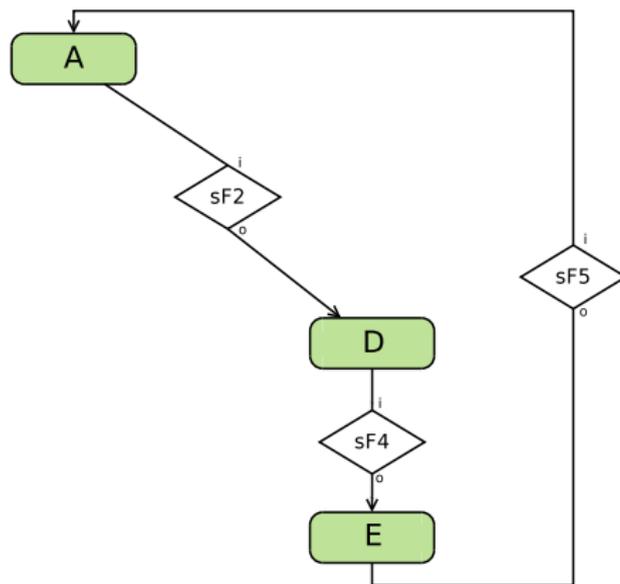


# Gestion des cycles

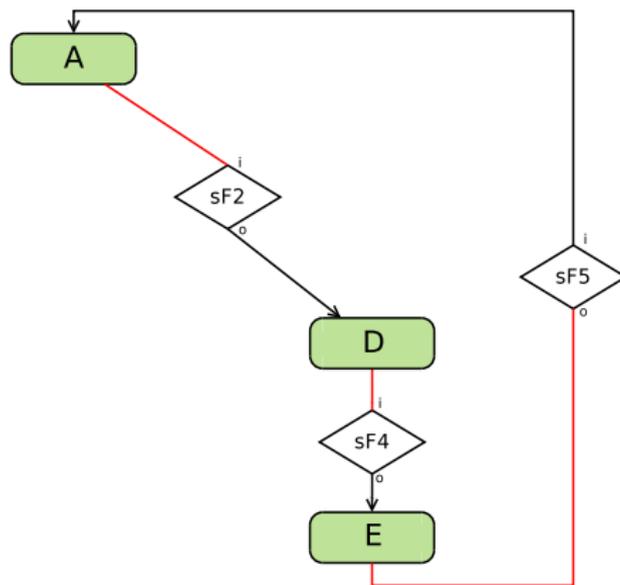




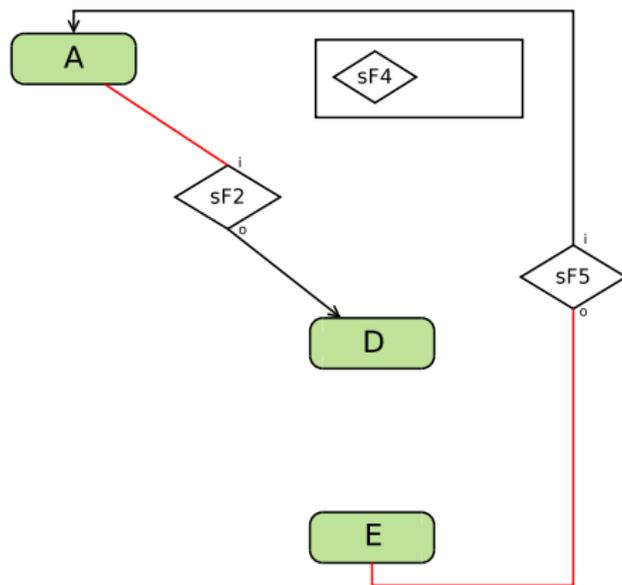




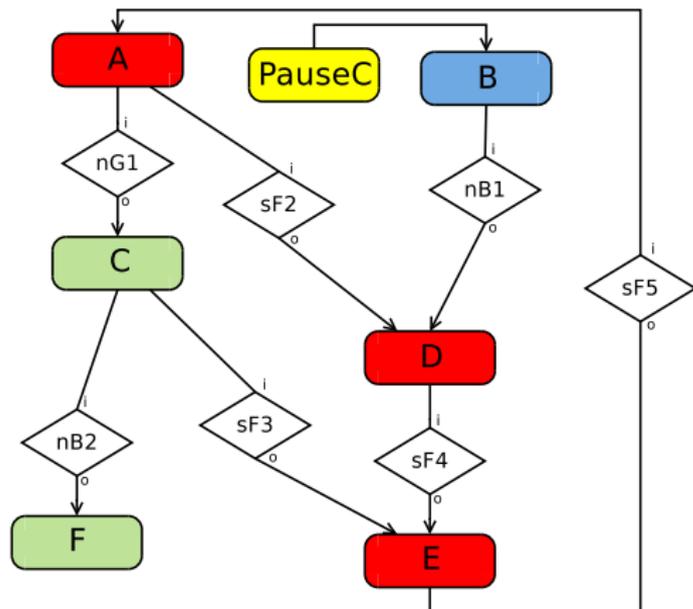
# Gestion des cycles



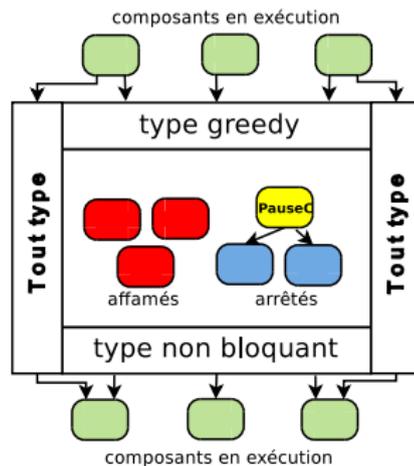
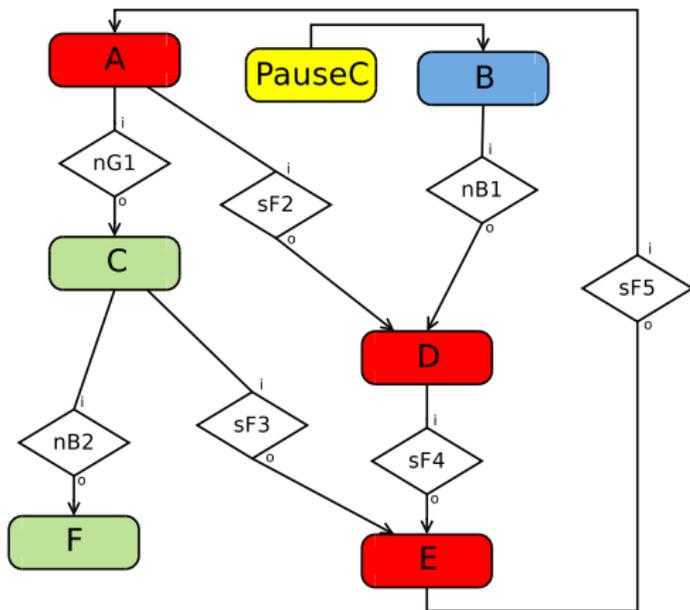
# Gestion des cycles



# Reconfiguration



# Reconfiguration



- ▶ ComSA : approche dédiée aux applications de visualisation scientifique interactive
  - ▶ Coordination exogène dirigée par les données
  - ▶ Favoriser la performance
- ▶ La sémantique de ComSA est défini par sCFN :
  - ▶ Absence des blocages : place vivacité
  - ▶ Condition de démarrage
- ▶ La reconfiguration à la volée des applications

- ▶ L'étude de la cohérence des données : Perte des données
- ▶ Extension du modèle avec des composants parallèles et des composants hiérarchiques :
  - ▶ Composants composites
  - ▶ Reconfiguration hiérarchique
- ▶ Composition temporelle.

Virtual applications strict Tokens  
Data Architecture Consistency Modeling  
Services visualization  
Connector Synchronization  
Reality  
Colored Interactive  
Components Simulation  
FIFO  
networks