Reducing communications on a dense Cholesky factorization

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Contexte

1. Computer science department of the university of Bordeaux
2. Topal’s team with Olivier Beaumont, Lionel Eyraud-Dubois and Mathieu Vérité
3. Internship: Creation of data allocation and scheduling strategies.
Cholesky Factorization

Ax = b and A = LL^T

∀i, j ∈ {1...S} ∀k ∈ {1...P} x^k_{i,j} ∈ {0; 1}
∀i ∈ {1...S} ∀k ∈ {1...P} y^k_i ∈ {0; 1}
State of the art: 2DBC and SBC

2DBC

SBC
Pattern research with a linear problem solver

1. Description of the problem with constraints
2. Using CPLEX to solve the problem

Constraints

1. \( \forall i, j \in \{1 \ldots S\} \sum_{k \in \{1 \ldots P\}} x_{i,j}^k = 1 \) allocation
2. \( \forall i, j \in \{1 \ldots S\} \forall k \in \{1 \ldots P\} \begin{align} x_{i,j}^k &\leq y_i^k \\ x_{j,i}^k &\leq y_i^k \end{align} \) Cost trigger
3. \( \forall k \in \{1 \ldots P\} \sum_{i,j \in \{1 \ldots S\}} x_{i,j}^k \leq M \) load distribution
4. \( \forall i \in \{1 \ldots S\} \sum_{k \in \{1 \ldots P\}} y_i^k \leq \alpha \) communication
Pattern research with a greedy algorithm

Trying to find another method more time-efficient. An algorithm on two steps:

1. For every node, find the tiles where it’s the more efficient
2. Using a coupling algorithm to find what are the best tiles for every nodes
What’s next?

After obtaining results from the two methods I will test them on plafrim to see if the time and communications are reduced.