COSC 6374
Parallel Computation

1st Homework

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Spring 2009

1st Assignment

- Rules
  - Each student should deliver
    - Source code (.c, .h and Makefiles files)
      - Please: no .o files and no executables!
    - Documentation (.pdf, .doc, .tex or .txt file)
  - Deliver electronically to gabriel@cs.uh.edu
  - Expected by Wednesday, February 25 , 11.59pm
  - In case of questions:
    - ask the TAs first, if he doesn't know the answer, he will ask me.
    - Ask early, not the day before the submission is due

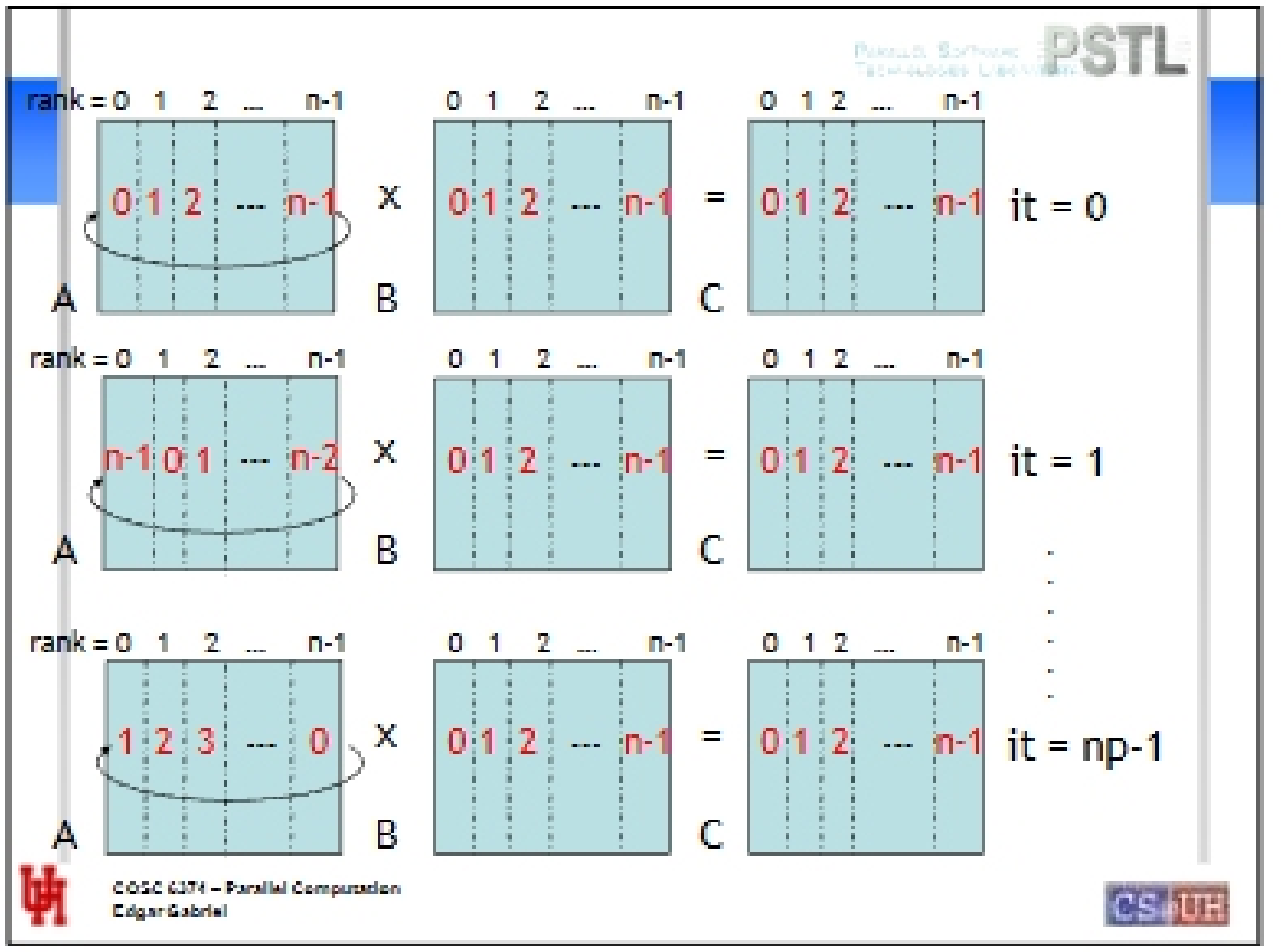
Part 1

- Implementing a parallel Matrix-Matrix multiply operation $C = AB$
  - 1-D block-column distribution of all matrices
  - Based on shifting the local portion of A from one process to the next (see next slides)

$$c_{ij} = \sum_{k=0}^{N} a_{ik} b_{kj} = \sum_{p=0}^{np-1} \sum_{k=0}^{(N/np)-1} a_{ik} b_{kj}$$

Part 1

- Initialize the matrix C to zero
- Initialize the matrices A and B to random values between 1 and 10
- Matrices shall be double precision floating point values
- In every iteration
  - a process calculates the partial result of the Matrix-Matrix multiply
  - sends the current portion of the Matrix A to its right neighbor
  - receives the next portion of the Matrix A from its left neighbor


PSTL
rank = 0 1 2 ... n-1
0 1 2 ... n-1
A
B
C
X
=
it = 0
n-1 0 1 ... n-2
it = 1
1 2 3 ... 0
it = np-1
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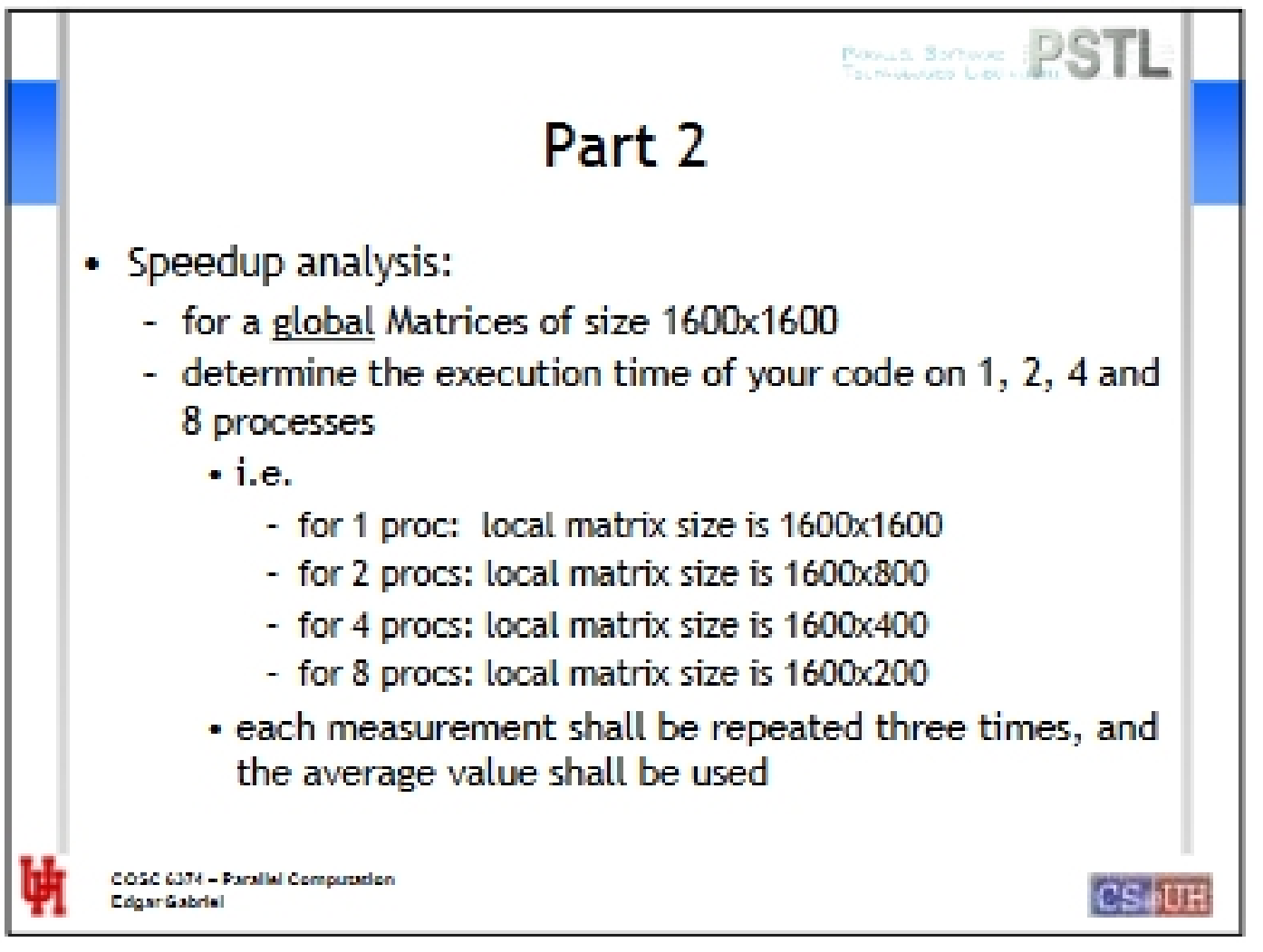
PSTL
Part 2
• Speedup analysis:
- for a global Matrices of size 1600x1600
- determine the execution time of your code on 1, 2, 4 and 8 processes
• i.e.
- for 1 proc: local matrix size is 1600x1600
- for 2 procs: local matrix size is 1600x800
- for 4 procs: local matrix size is 1600x400
- for 8 procs: local matrix size is 1600x200
• each measurement shall be repeated three times, and the average value shall be used
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