



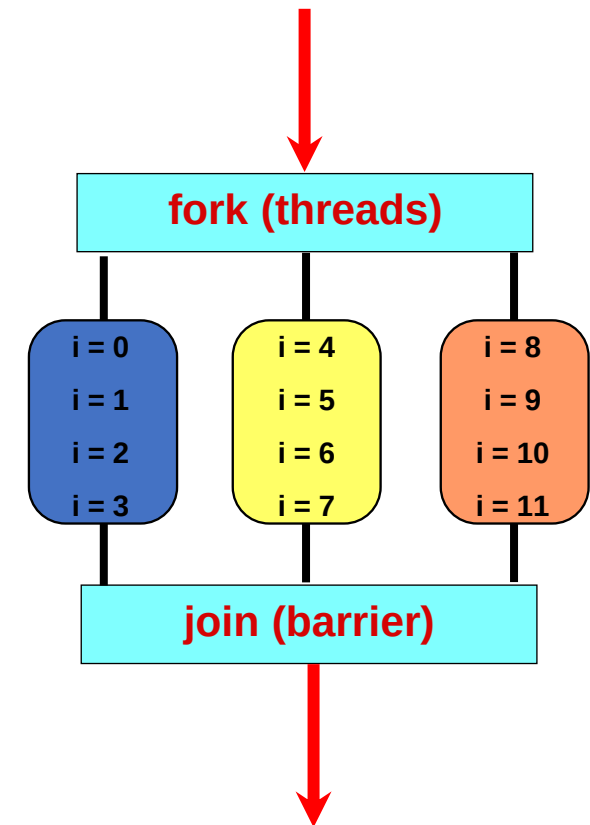
Memory and Performance

Ozcan Ozturk – Sabancı University

Parallelization and Memory

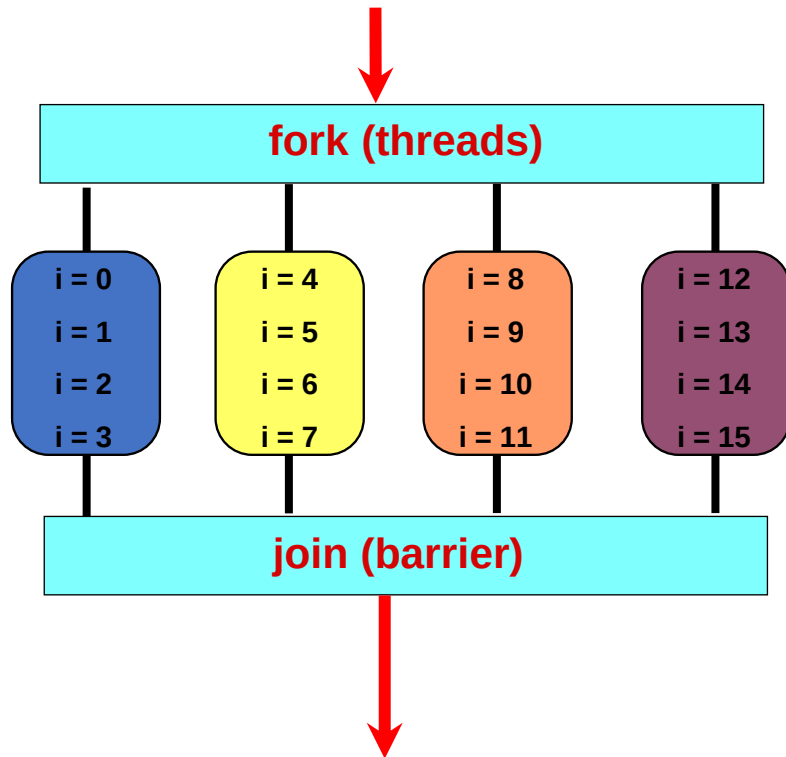
- Data parallel
 - Perform same computation but operate on different data
- A single process can fork multiple concurrent threads
 - Each thread encapsulates its own execution path
 - Each thread has local state and shared resources
 - Threads communicate through shared resources such as global memory

```
for (i = 0; i < 12; i++)  
    C[i] = A[i] + B[i];
```

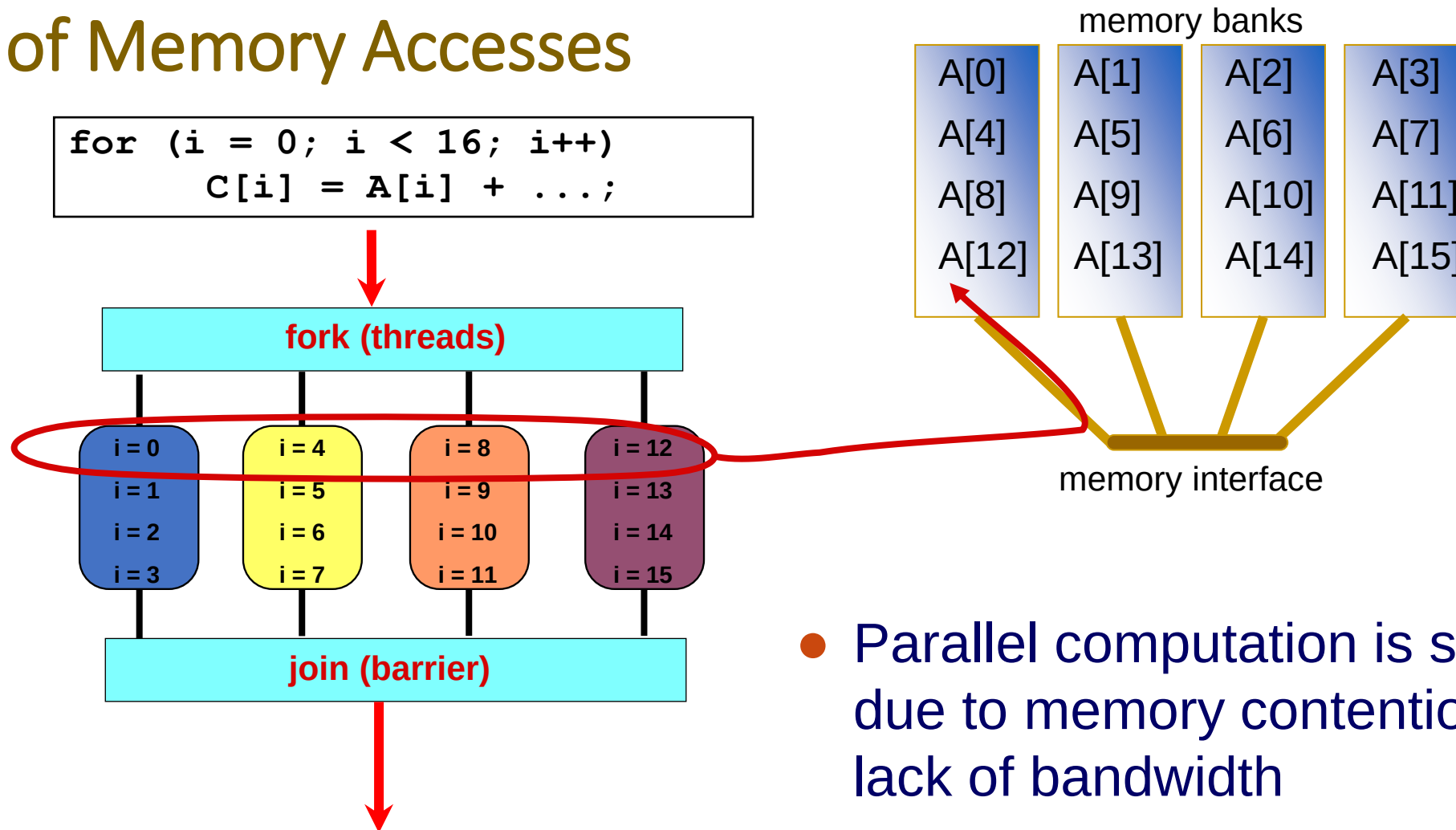


Locality of Memory Accesses

```
for (i = 0; i < 16; i++)
    C[i] = A[i] + ...;
```

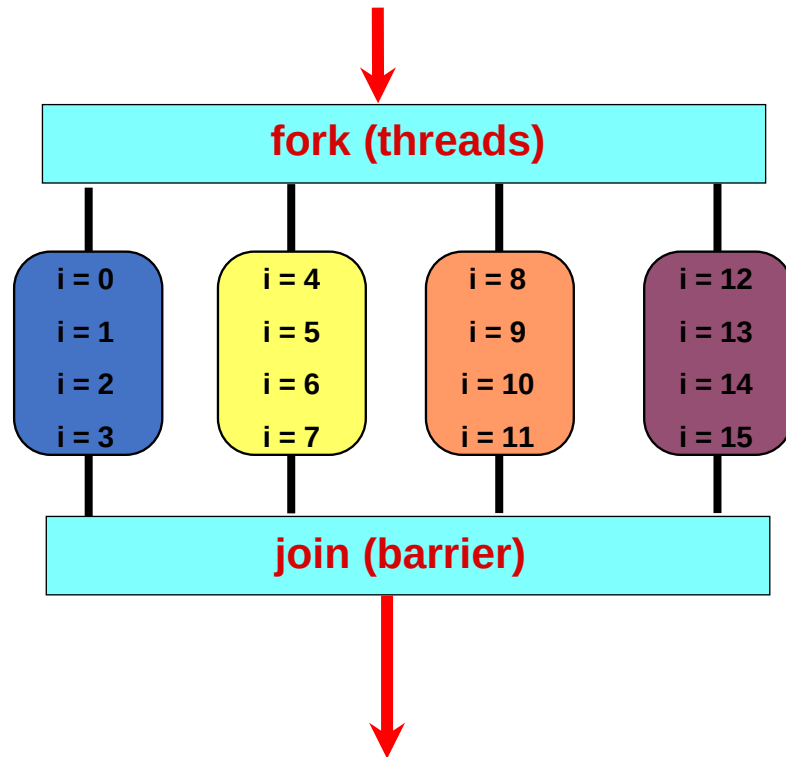


Locality of Memory Accesses

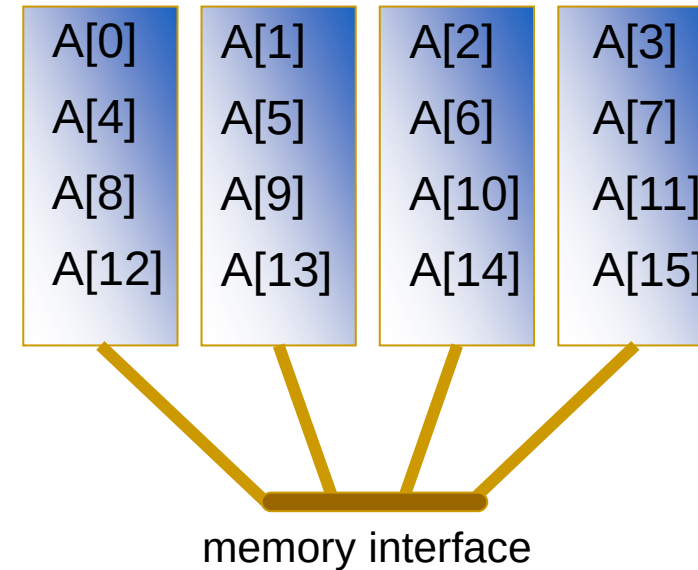


Locality of Memory Accesses

```
for (i = 0; i < 16; i++)
    C[i] = A[i] + ...;
```

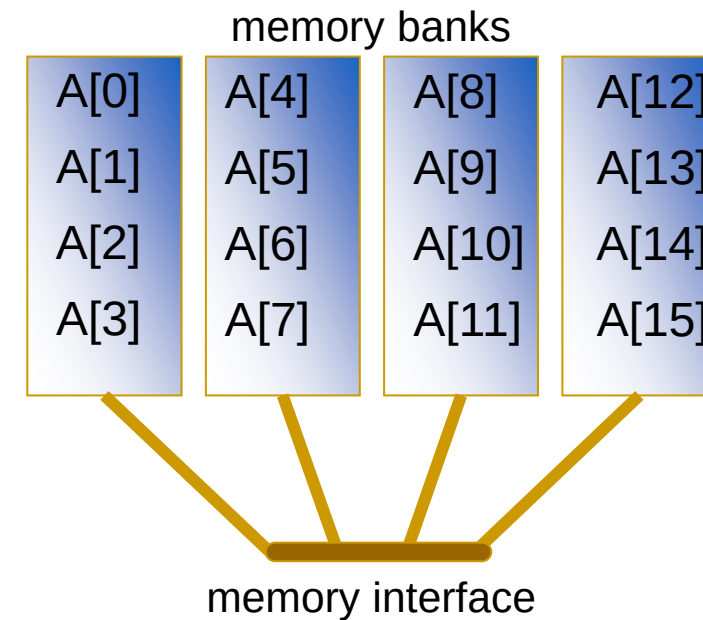
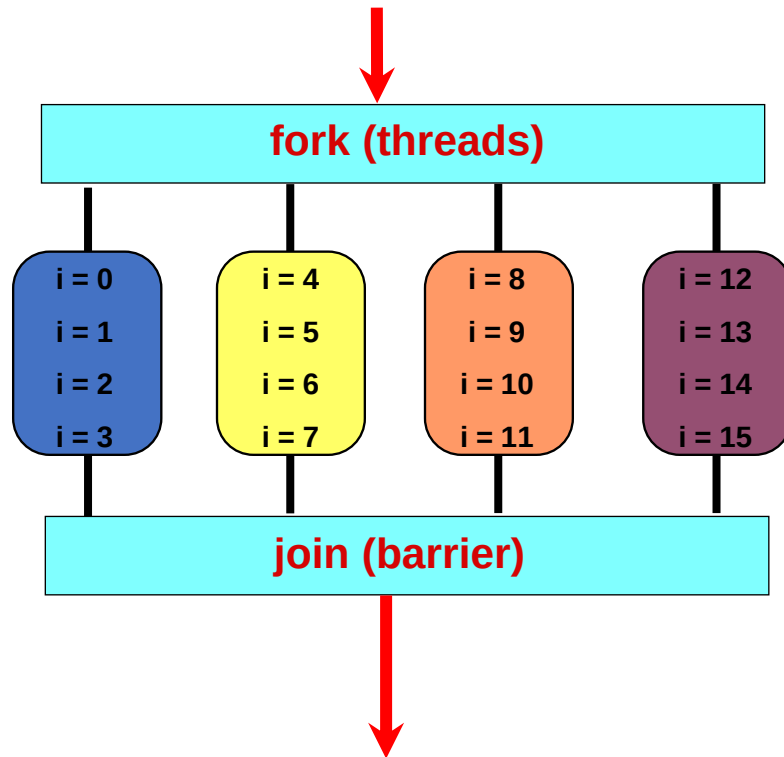


memory banks



Locality of Memory Accesses

```
for (i = 0; i < 16; i++)
    C[i] = A[i] + ...;
```



- Distribute data to relieve contention and increase effective bandwidth

Next Lecture

- Memory Performance Monitoring And Optimizations

References

Grama, Ananth, Anshul Gupta, George Karypis, and Vipin Kumar. 2003. *Introduction to Parallel Computing*. 2nd ed. Boston: Addison-Wesley.

Sabancı Universitesi Thank you!



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