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Distributed Computer System

Issued by:

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reference:

ADVANCED COMPUTER ARCHITECTURE AND PARALLEL PROCESSING

Distributed Computer System

Distributed computer system :

- Content multiple cooperation computed resources (processors), among them the work distributed.

Interesting for us :

- Properties and structure of computers, task and data.

Parallel computed Theory

Sequence evolve of theory of parallel computing :

1. C.A Petri; 1962, Describe System with Parallelism.
2. E.Dijsktra; 1965, Problem Critical Area.
3. Mflynn; 1966, Taxonomy Parallel Architecture.
4. G.Amdahl; 1967, Bounds Effective Parallel System.
5. E.Dijsktra; 1968, Semaphore.
6. D.Adams; 1968, “Dataflow ” architecture.
7. T.Hoare; 1978, Communication Sequential Processes.
8. H.F.jordan, 1978, Barrier Synchronization.

Sequence computed evolve:

- Theoretical model A.Turing
  (1934. "On computable numbers,.....").
- Practical design J.von Neumann (1945).
- Processor (divided to control and arithmetic and unit), memory and input/output.
- Working with one sequence instruction and one sequence data (concert problem).
- 1. and 2. generation computer (1945-1955-1964), electronic /discreet transistors.

parallel computed evolve:

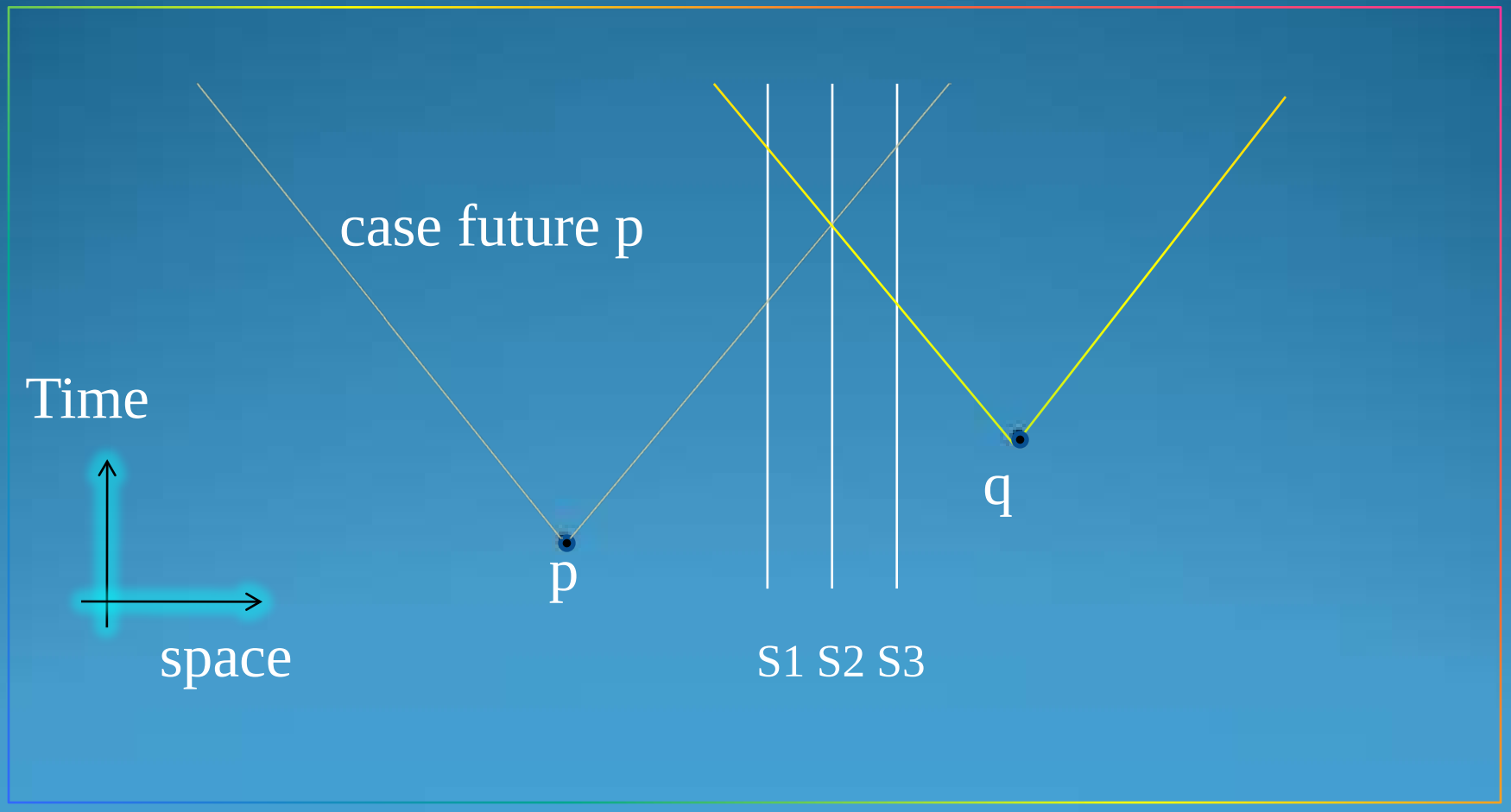
Practical realizing was complex by:

- 3. generation (1965-1974):
  _integration circuits (with logical gate).
  _Multiple function units, ”pipeline”.
  _Multiprogramming, share time CPU, service OS.
- Ethernet (1973),Xerox ,Palo Alto.
- 4. generation (1975-1990):
  _Multiprocessors ,Multicomputer , vector processors .
  _Multiprocessing ,Multithreading.

Model properties:

1. Multiple automatic computing subsystem:
   -computers ,processors.
2. Mutual connection ,Communication :
   - computer Network ,buses.
3. Coordinates activity ,Synchronization.
4. Mutual sharing resources:
   -Memory ,compact disk and computing time.
5. Multiple computing system communication and cooperation to speedup solve big work.

Parallelism physical effect 1



Parallelism physical effect 2

- Event *p* and *q* are independent ,can't have mutual effect because no one from them can happen in case future of another.
- Look in s1 see at first event *p* and then *q*.
- Look in s2 will be change order in opposite.
- Look in s3 can form that both events happen together.
- Note: haven't never information about which event occur before.

Parallelism physical effect 3

- For exact describe event in distributed system can't use full (linear) ordering (format) ,while for a lot of practical cases like this model is suitable.
- Not each two events show ordering in time.
- Not each distributed system give:

$$T(p) < T(q) \vee T(q) < T(p) \vee T(p) = T(q).$$

- *Models actually parallelism use partially ordering.*

Parallelism Reasons

- Physical restriction.
- Reliability ,Accessibility.
  -HA (High Availability)
- Efficiency
  -HPC (High Performance Computing)
- Synchronization systems

Physical Restriction 1

1. System ,Which are his spirit(matter)- “from nature” physical distribution.
2. Sequence system here can’t use.
3. Not interest about performance , neither about reliability ,but about capability execute with multiple inputs together.
4. System reflects natural distribution inputs where data and control process.
5. For example// system control break when haven’t response for his input immediately not until finish his assigned time.

Physical Restriction 2

6. Distributed database:

-Haven't reason "Bear" data on one place.

-Branches of big organization.

Note:

Control system have wide technological processes:

- Specially remote sensor and actuators.
- Monitoring & control system from away (remote control)
- Multi input data flow must keeping execute together.

Reliability

1. Distribution system can be open additional redundant component for rising all dependency.
2. Reduction components in distributed system have less effect on all performance system than in system with unique resources.
3. Can increase quality service and efficiency , decrease response time but functionality remains.
4. For example// dropout DNS service in network can't full access to files in servers.

Performance 1

1. May be major reason examination and exploitation.
2. When one processor not provides adequate execution;
   - Time critical application (ex. Reactive system with strait time restriction ,weather ,finances).
   - Time-consuming; big data or long loop.
   - More rising demand application than efficiency machine.
3. When solution on sequence architecture takes loss long time.
4. When we want solve complex problems.

Performance 2

5. Efficiency processes long rang rising (but for when?).
6. In past was efficiency supercomputing comparing with latest processors.
7. Always will be enough problem overlaps capability (grand challenge).
8. Most problem is naturally parallel.
9. Highest execute is can obtain from usable multiple processors at same time (simultaneously).

Moore rule

- Gordon Moore:

  -count transistors on chip duplicate each 18 months (1965); duplicate each two years (1995).

  -"Moore rule " get from direct conflicts with natural laws(1997).

- Simultaneously technology: 90nm,65nm,45nm,32nm,?!?

Problem 1

- Technological :

  1-litography (Pentium Pro. 0.35µm~ violet light)

  2-193n~UV (electron burning).

  3-Immersion lithography ,quantization lithograph.

- Physically

  1- electronic show quantizes effect , tunneling.

  2- electronic don't repair like electrical current ,escaping through fault vertex copper pins , leak interfere thin isolator layers (oxide) in chip most usage.

Problem 2

- Cooling :

  1-chip turn on normal heat (P4~100W,30W/cm^2).

  2-cooling need raising with raise frequency.

  3-Past with nanostructure , spray or liquid.

- Replacement silicon semiconductor ??

  1- carbon nano-tube practically one dimension.

  2-change radius and curve is may be open various properties today's semiconductors

Synchronies circuit

- What do processor between two edge clock ?
- How get clock suddenly for all part chip?

Asynchronies circuit

- Never clock:

1- more smaller needed (mobile equipment).

2- less emitting (noise).

3-more execute (mean speed component).

4- different work can execute simultaneously, different speeds.

5-less dimension, more complex application.

- Negotiable solution : mixed circuits.
- Intel Pentium 4 has some parts asynchronous.
- SUNFLEETzero- prototype asynchronous chips.