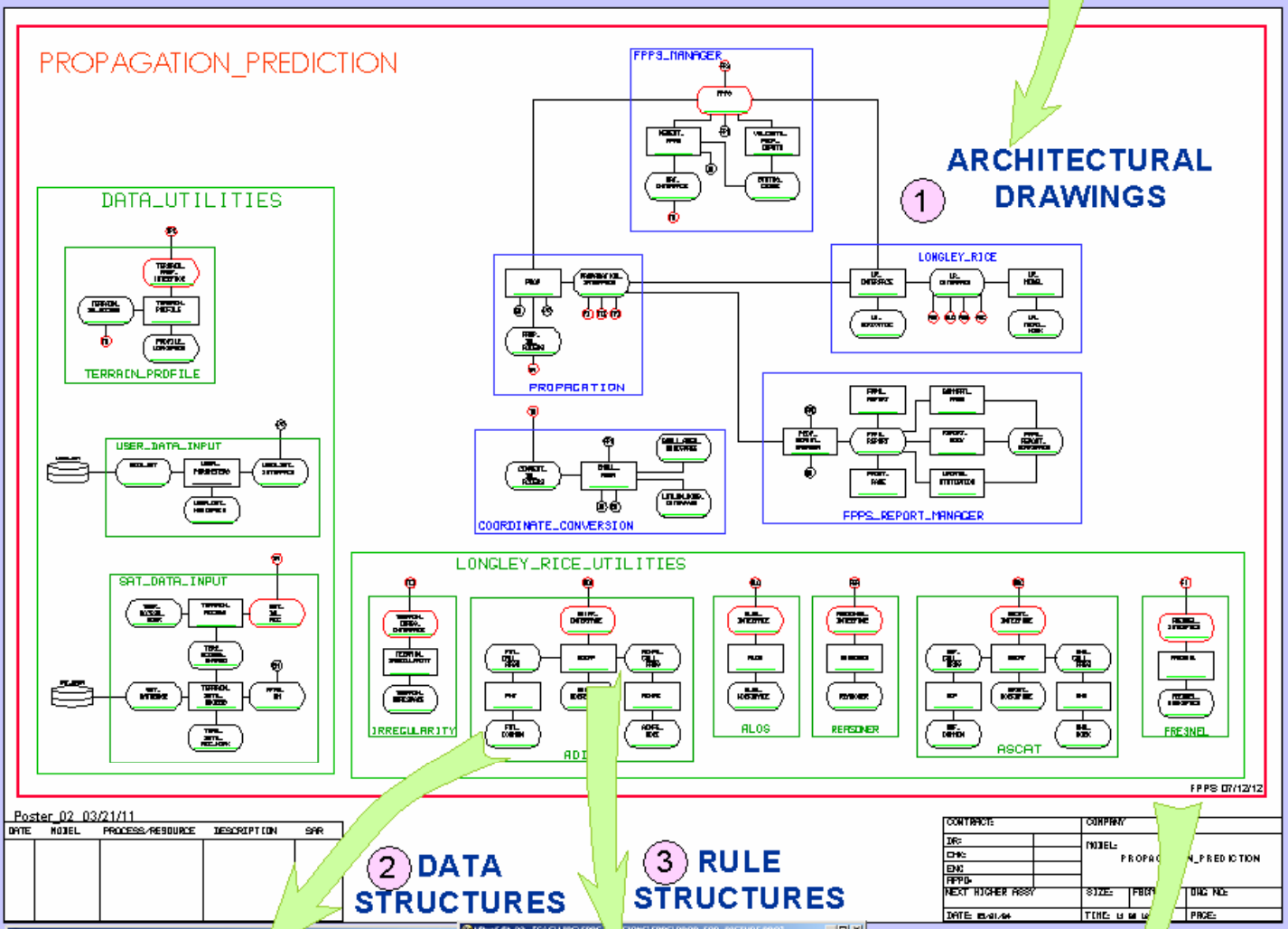
BASIC *VisiSoft* COMPONENTS

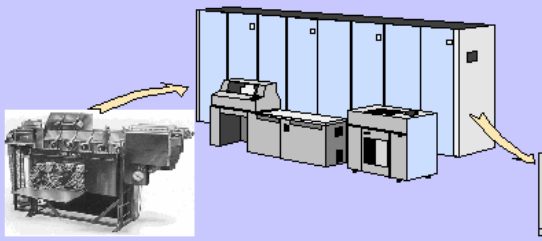



```
FPPS_INPUT_DATA
   1  SYSTEM_PARAMETERS
      2  SYSTEM_ACTION                    CHAR 1
         ALIAS VALID_SYSTEM_ACTION  VALUE 'C','R','X','Y','T','P'
         ALIAS INITIALIZATION       VALUE 'I'
         ALIAS TRANSFORMATION       VALUE 'X','Y'
         ALIAS PROPAGATION_CALC     VALUE 'C','R','P'
         ALIAS REPORT               VALUE 'T'

      2  ALGORITHM_CHOICE                 INTEGER
         ALIAS VALID_ALG_CHOICE     VALUE 6,7,8,9
         ALIAS GET_ELEVATION        VALUE 1
      2  PATH_PROFILE_ONLY_FLAG           CHAR 1
         ALIAS SET                  VALUE 'Y'
      2  LOS_ONLY_FLAG                    CHAR 1
         ALIAS SET                  VALUE 'Y'
      2  PROCESS_FOLIAGE_FLAG             CHAR 1
         ALIAS SET                  VALUE 'Y'
      2  REPORT_SELECTION                 CHAR 1
         ALIAS VALID_RPT_SELECTION  VALUE 'F','S','N'
         ALIAS OPEN                 VALUE 'F','S'
         ALIAS FULL                 VALUE 'F'
         ALIAS SUMMARY              VALUE 'S'
      2  PAD                              CHAR 04

   1  COORDINATE_SYSTEM                   CHAR 1
      ALIAS VALID_COORD_SELECTION   VALUE 'I','M','L'
      ALIAS LATLON                  VALUE 'L'
      ALIAS MGRS                    VALUE 'M'
      ALIAS INTERNAL                VALUE 'I'

   1  XMTR_POSITION
      2  XMTR_REL_POSITION
         3  XMTR_REL_X                    REAL
         3  XMTR_REL_Y                    REAL
         3  XMTR_REL_Z                    REAL
      2  XMTR_MGR_POSITION                CHAR 15
      2  XMTR_GEO_POSITION
         3  XMTR_LAT                      REAL
         3  XMTR_LON                      REAL
      2  XMTR_ANTENNA_HEIGHT              REAL
      2  XMTR_ANTENNA_REFERENCE           CHAR 1
         ALIAS VALID_REFERENCE VALUE 'S','G'
         ALIAS SEA             VALUE 'S'
         ALIAS GROUND          VALUE 'G'
```

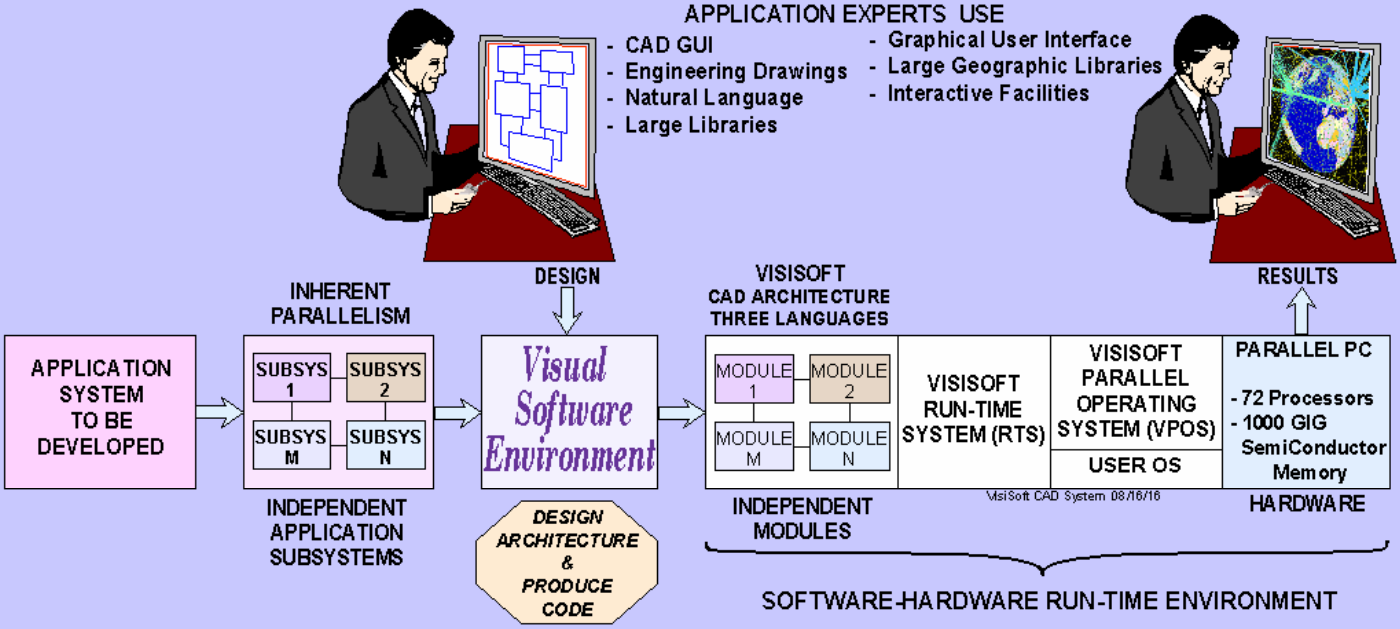
```
PROPAGATION_MODEL
    IF USER_DATA_STATUS IS NOT INITIALIZED
       MOVE USER_DAT_INTERFACE TO USER_DATA
       EXECUTE FOLIAGE_HEIGHT_INPUT .

    IF SYSTEM_ACTION IS PROPAGATION_CALC
    OR SYSTEM_ACTION IS EQUAL TO LOS
       EXECUTE COMPUTE_SECTION
    ELSE
    IF SYSTEM_ACTION IS RECOMPUTE
       EXECUTE RECOMPUTE_SECTION .

    IF ERROR_CODE IS NOT DETECTED
    AND REPORT_SELECTION IS OPEN
          CALL PROP_REPORT_MANAGER .

FOLIAGE_HEIGHT_INPUT
    IF PROCESS_FOLIAGE_FLAG IS SET
          MOVE USER_DAT_INTERFACE AVER_BUILDING_HEIGHT
             TO FOLIAGE_HEIGHT .

COMPUTE_SECTION
    CALL VALIDATE_PROP_INPUTS
    IF ERROR_CODE IS DETECTED
       EXIT THIS RULE .

    EXECUTE COMPUTE_COORDINATES
    EXECUTE COMPUTE_ANTENNA_HEIGHTS
    EXECUTE CALCULATE_FREESPACE_LOSS
    EXECUTE BUILD_TERRAIN_PROFILE

    IF PATH_PROFILE_ONLY_FLAG IS SET
       EXIT THIS RULE.

    CALL TERRAIN_IRREGULARITY
    IF PROCESS_FOLIAGE_FLAG IS SET
       EXECUTE INVOKE_FOLIAGE_MODEL .

    EXECUTE CALC_EFF_ANT_HEIGHTS
    EXECUTE INVOKE_TERRAIN_MODEL
    EXCESS_PATH_LOSS = EXCESS_PATH_LOSS + FOLIAGE_LOSS

RECOMPUTE_SECTION
    EXECUTE CALCULATE_FREESPACE_LOSS
    IF PROCESS_FOLIAGE_FLAG IS SET
       EXECUTE INVOKE_FOLIAGE_MODEL .

    EXECUTE INVOKE_TERRAIN_MODEL

COMPUTE_COORDINATES
    START_X = (XMTR_REL_X + DBASE_SCALE) / DBASE_SCALE
    START_Y = (XMTR_REL_Y + DBASE_SCALE) / DBASE_SCALE
    END_X   = (RCVR_REL_X + DBASE_SCALE) / DBASE_SCALE
    END_Y   = (RCVR_REL_Y + DBASE_SCALE) / DBASE_SCALE
```

```
CONTROL SECTION
    TITLE, SATELLITE SIMULATION
    SIMULATE
    TRACE

LIBRARY SECTION
    C:\S\LIBS\FPPSLIB
    C:\S\LIBS\SAT_LIB
    C:\S\LIBS\RTG_DRAW
    C:\S\LIBS\GENERAL

GRAPHICS SECTION
    ACTIVATE
    BACKGROUND_COLOR = GRAY(55)
    WORLD_SPACE LOWER_LEFT=(-35000,-11000),
                UPPER_RIGHT=(100000,101000)
    INITIAL_WINDOW LOWER_LEFT = (-12000, -8000), WIDTH = 100000
    NVS/BDS = .2
    ICON RADIO      = TRUCK
    ICON TANK       = TANK
    ICON SATELLITE  = SATELLITE
    ICON PLANE      = PLANE
    LINE GATEWAY_LINE = COLOR GREEN, STYLE 2, THICKNESS 1
    INST COLLISION_PERCENT = THERM_BOX_VERTICAL,
             LOW 0, HIGH 100, INITIAL_VALUE 0, COLOR GREEN

    OVERLAY 1 = DRAW_CELL_CONTOURS IN CELLDRAW IN OVERLAYS
                AT 0, 0, SCALE 20, 20, MENU CONTOURS
                   COLOR BROWN(30)

    OVERLAY 2 = DRAW_GRID_LINES    IN GRID_DRAW IN OVERLAYS
                AT 0, 0, SCALE 1, 1, MENU GRID_LINES
                   COLOR DARK_BLUE

    RTG_EVENT_HANDLER PROCESS_GRAPHICS_EVENT

DATABASE INPUTS
    ASSIGN SFI 'BER_LINE.SFI'  TO READ_BER_LNE_SFI_PROCESS
    ASSIGN SFI 'SIP_BER.SFI'   TO SIP_BER_TAB_SFI_PROCESS
    ASSIGN SFI 'CONNECT.SFI'   TO READ_CONNECTIVITY_SFI
    ASSIGN SFI 'COUL.SFI'      TO COUL_INIT_PARAMETERS *** USE FOR TCP
    ASSIGN SFI 'DEFAULT.SFI'   TO READ_DEFAULT_PARAMS
    ASSIGN SFI 'DEPLOYIN.SFI'  TO READ_DEPLOYMENT_SFI
    ASSIGN SFI 'DLL_PARM.SFI'  TO DLL_READ_PARAMETERS
    ASSIGN SFI 'ENVIRNMT.SFI'  TO READ_ENVIRONMENT_PARAMS
```

To penetrate real markets requires economic superiority - minimizing time and cost - to build, operate, and improve.



The Parallel PC with a
CAD development environment



Ts = RUN_TIME_SERIAL  Tp = RUN_TIME_PARALLEL

Np = NUMBER OF PROCESSORS

Speed Multiplier: SM = Ts / Tp

Processor Utilization Efficiency: PUE = SM/ Np

Economic (Speed Multiplier) Superiority using VisiSoft:

Single Processor Speed Multiplier..... X of 100+

Mapping of Inherent Parallelism..... Direct Architectural Mapping

Processor Utilization Efficiency..... PUE = 85% - 95% - versus 7% - 10%

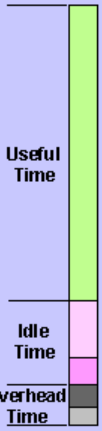
VisiSoft Parallel OS (VPOS)..... X of 5 to 10+

Better use of Chip Space..... for Memory - the Critical Component

Distance Factor..... Footprint cut by 100

A TESTED THEORY - PROVEN BY SCIENTIFIC EXPERIMENT

PROCESSOR UTILIZATION



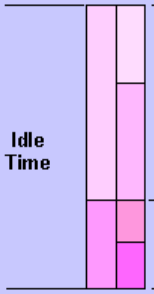
Useful Time — Time spent processing the problem including single processor overhead functions.

Idle Time — Excess time spent waiting for inter-processor control transfers.

Excess time spent waiting for inter-processor data transfers.

Overhead Time — Excess time spent reallocating resources (processor assignment, load balancing, etc.).

Excess time for other parallel processing overhead.



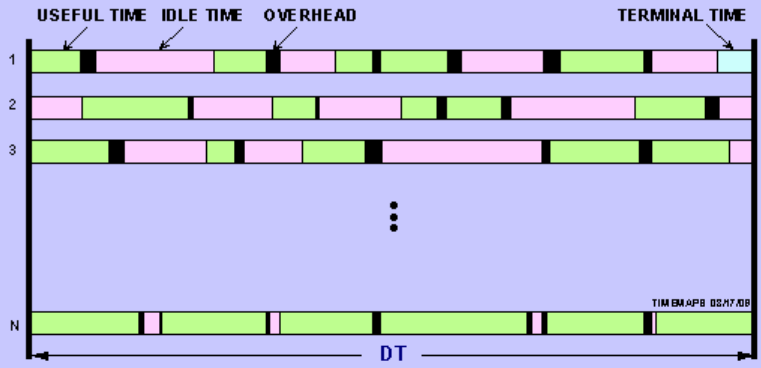
Idle Time

Excess time spent waiting for inter-processor control transfers
- Due to lack of inherent parallelism
- Due to poor software architecture

Excess time spent waiting for inter-processor data transfers
- Due to lack of inherent parallelism
- Due to poor software architecture

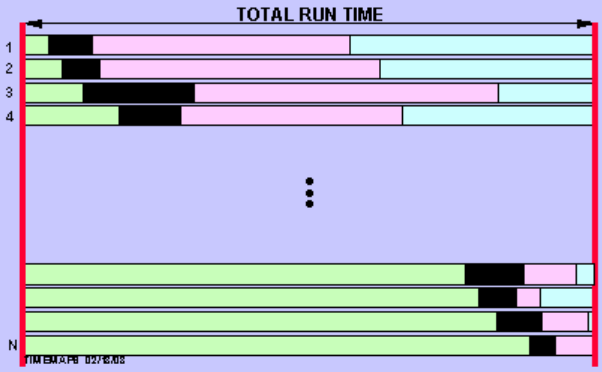
EXAMPLE OF PROCESSOR (N) UTILIZATION IN DT

Ordered By Processor (N) Utiliztion in DT



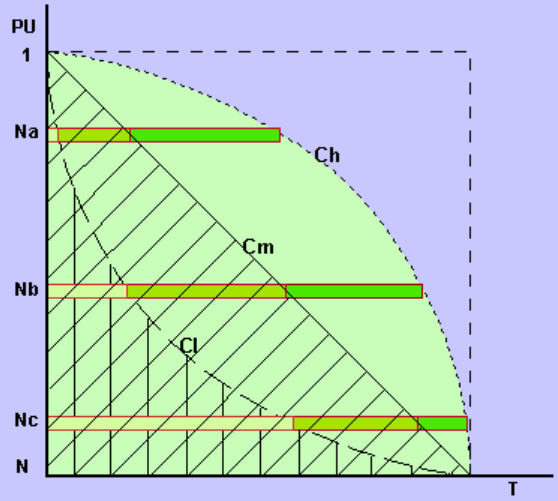
PROCESSOR UTILIZATION FOR TOTAL RUN

Time Ordered By Utilization

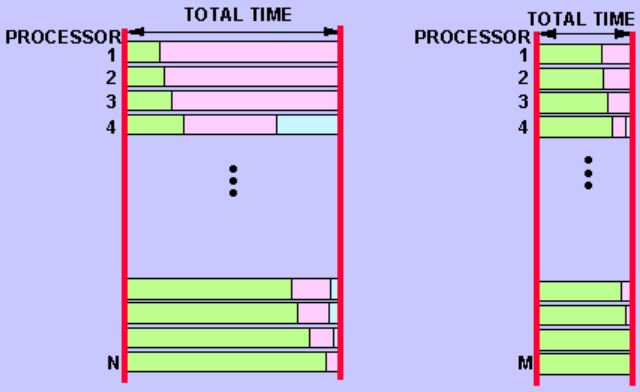


ESTIMATING PROCESSOR UTILIZATION (PU) EFFICIENCY

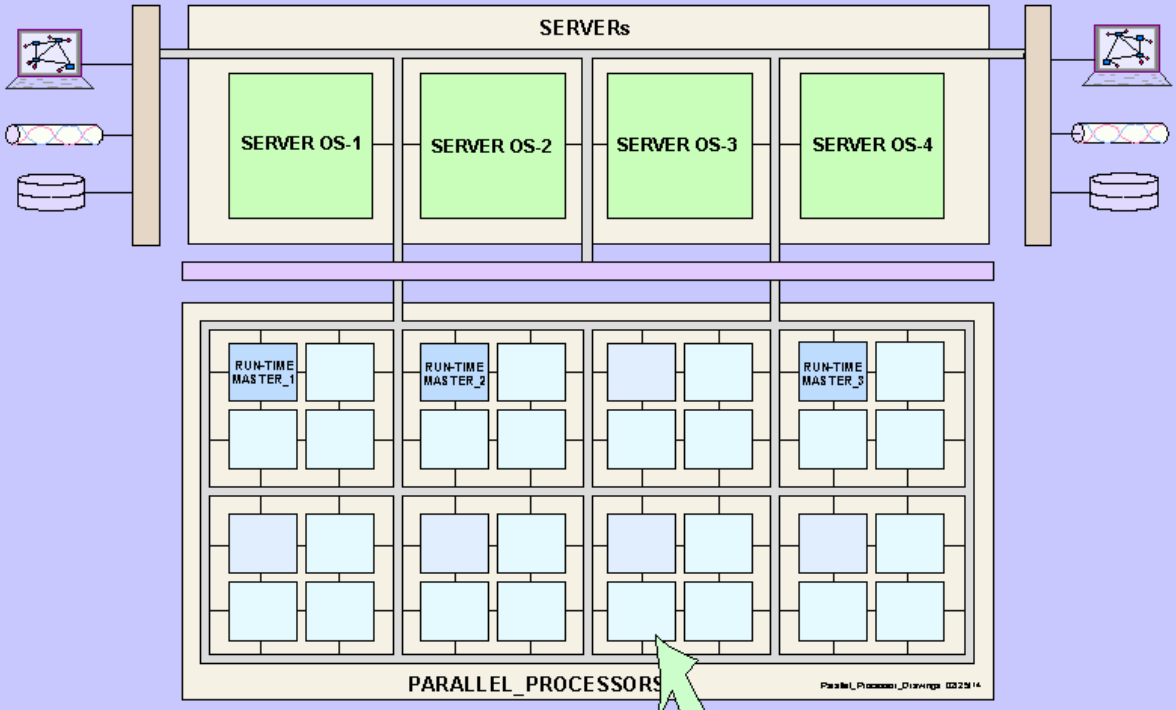
(Area under the curve)



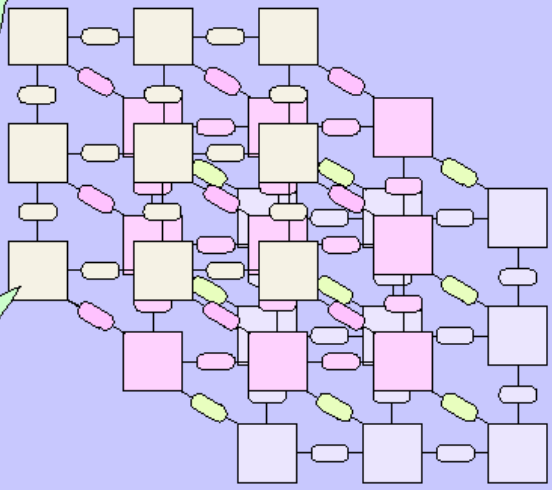
REBALANCING THE LOAD CUTS TIME & IMPROVES PUE



GENERAL FORM OF A PARALLEL PROCESSOR FACILITY



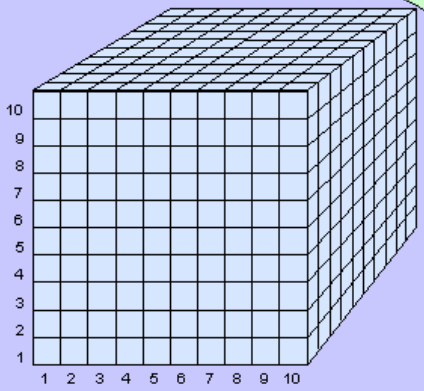
3 x 3 x 3 =
27 Major Cells



For Fine-Grain Problems,
use an optimized breakdown, e.g.,

A matrix of 27 major cells
Contains 27,000 minor cells.
If each major cell is an IND Module
then 27 processors contain 27000 cells.

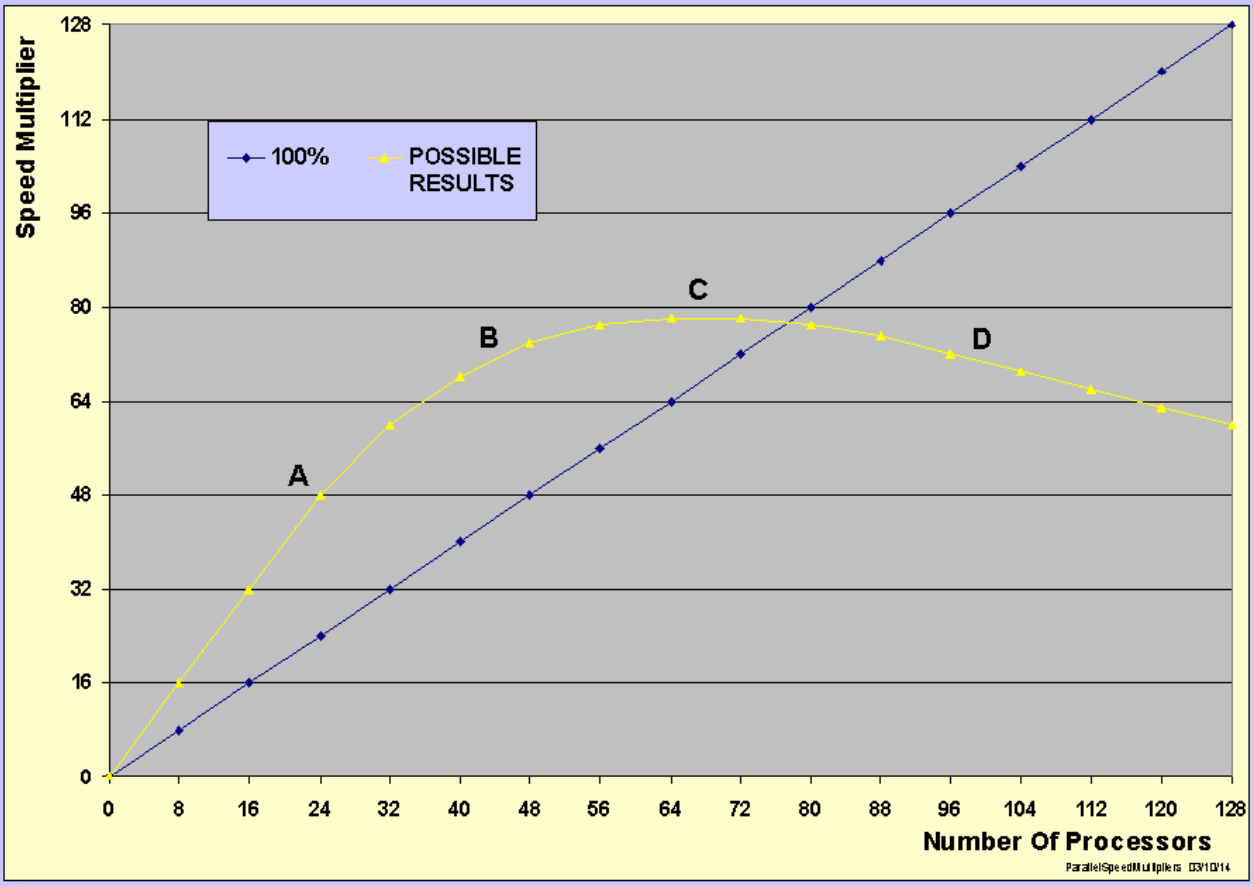
10 x 10 x 10 =
1000 Minor Cells



A single resource is shared between each face of each major cell.

A single resource is shared between each face of each minor cell.

With the VisiSoft CAD environment - on a 32 processor Parallel PC - you can run faster than a 320,000 processor HPC!



A - How does one obtain a Speed Multiplier (SM) that exceeds the number of processors?
By using the same *single processor speed* used by another party in the comparison that is much slower (by a factor of 100) than the VisiSoft single processor speed (when run on the same machine).

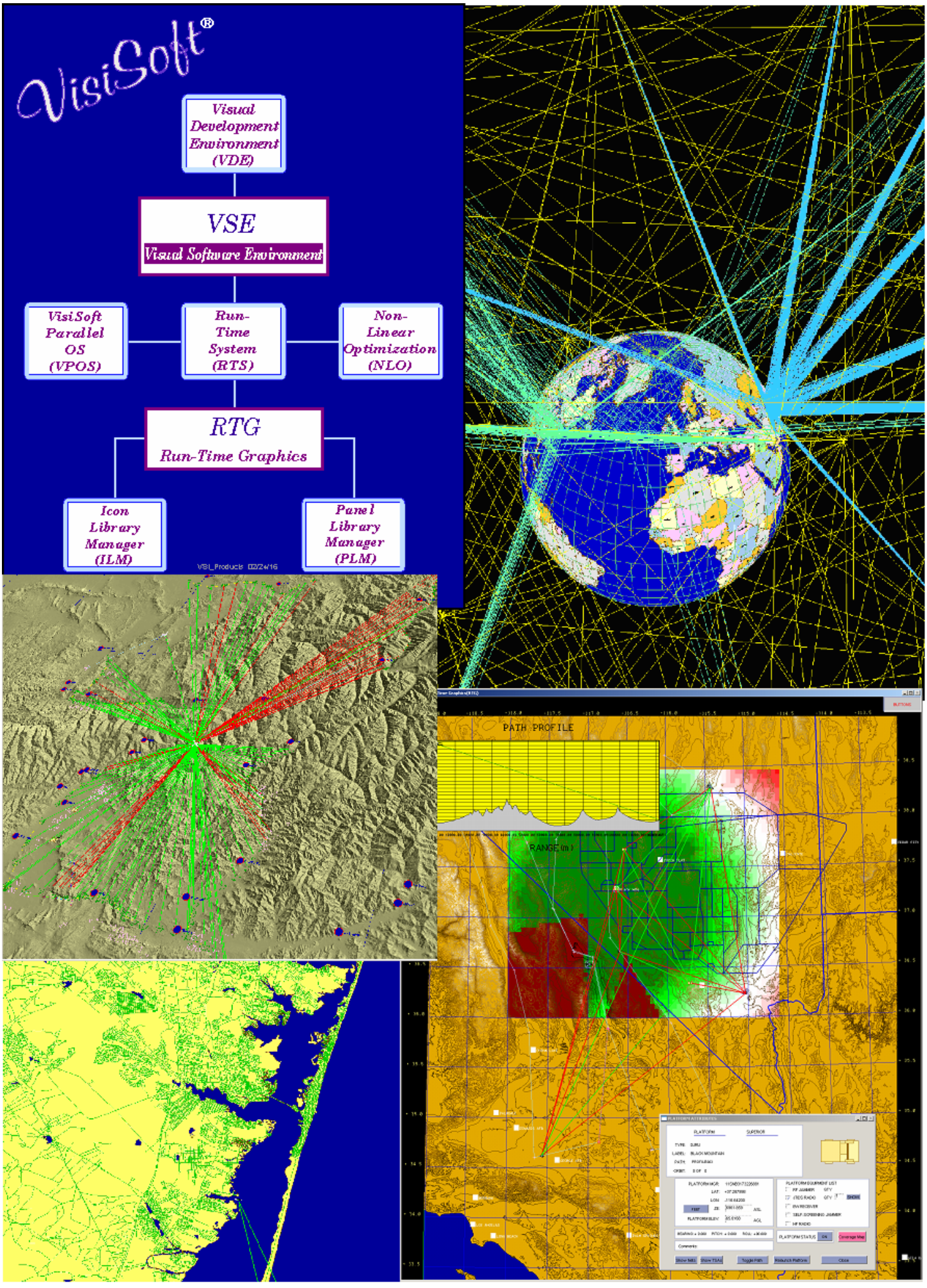
B - Why does the increase in SM start to decline as more processors are added?
Because of the *distance factor* and corresponding *memory boundary crossing delays* and *software overhead*.

C - Why does the SM level off as even more processors are added?
Because the Processor Utilization Efficiency (PUE) decreases with more processors.

D - Why does the SM start to decline as many more processors are added?
Because the Processor Utilization Efficiency (PUE) decreases nonlinearly with many more processors.

As more processors are added, the physical footprint grows.
This causes the PUE to decreases nonlinearly due to the:

- distance between processors
- memory boundary crossing delays
- corresponding communication delays
- additional overhead


VisiSoft®
Visual Development Environment (VDE)
VSE
Visual Software Environment
VisiSoft Parallel OS (VPOS)
Run-Time System (RTS)
Non-Linear Optimization (NLO)
RTG
Run-Time Graphics
Icon Library Manager (ILM)
Panel Library Manager (PLM)
VSL_Products 02/24/16
PATH PROFILE
RANGE(mi)