Abstract

The chronological events of the product creation of the medical imaging workstation are discussed. The growth in functionality and size from prototype to product is shown. Typical problems in this period are explained.
Chronology of Easyvision RF R1 development

1991
- basic application toolboxes
- 100 kloc
- interactive viewing

1992
- performance problems
- IQ problems
- Easyvision RF integrated product
- 360 kloc
- print server + communication + interactive viewing

1993

marketing opinion:
"All the functionality is available, we only have to provide a clinical UI"
SW Process structure 1991

remote systems and users

communication

user interface

user

import

data base

UI devices

export

network

disk drive

optical storage

print

optical disk drive

printer

system monitor

Unix daemons

software process

user control

control and data flow

associated hardware

User control
data flow
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MITORswLayers1991
Memory usage half way R1

![Graph showing memory usage](image)

- Total measured memory usage
- Performance
- Physical memory
- Paging to disk
- OS
- Code
- Data
- Bulk data
- Fragmentation

Memory usage: 64 MB
Data usage: 200 MB

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MSmemoryZeroMeasurement
Solution of memory performance problem

measured

bulk data

anti-fragmenting

budget based

DLLs

tuning

budget

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MSmemoryUsageReduction
Visualization memory use per process

- Visualization memory use per process is shown in the diagram.
- The graph plots data and code usage against budget per process.
- The data is measured on the left column and the budget is shown on the right column.
- The categories include shared libraries, UI, communication, server, storage server, print server, and other.

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MSmemoryBudget
Causes of performance problems other than memory use

- remote systems and users
- communication
- user interface
- processing
- data base
- network I/O overhead
- export
- file I/O overhead
- network
- disk drive
- optical storage
- print
- optical disk drive
- printer
- graphics updates
- framebuffer access
- UI devices
- data base granularity
- information model layering
- process communication overhead
- active data granularity, update
- I/O overhead
- network I/O
- overhead
- processing
- file I/O
- overhead

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MITORperformanceCauses
Image quality and safety problem

\[ f(x) \]

**false contour**

- 10 bits pixel value
- 8 bits pixel value
Safety problem

for user readability the font-size was determined "intelligently"; causing a dangerous mismatch between text and image

URF monitor output: fixed size letters at fixed grid
EV output: scaleable fonts in graphics overlay