Why workstation product group?

- Integration of functionality in hospital
  - + Multi modality
  - + Multi vendor
  - + Multi application
  - + Distributed application
- Balance of functionality inside and outside examination room
- Distributed applications, networking:
  - + scalability
  - + graceful degradation
  - + customization

Product = tuned platform + specific SW

- Platform consolidation of application knowledge
- Re-use in look-alike products
- Exploitation of technological and organizational experience

What is the platform?

- All SW and HW shared by multiple products
- Managed centrally by CDS
- Own lifecycle
- Continuous change and expansion:
  - + External changes (workstations, disks, optical media, framebuffers, keyboards, system software)
  - + New functionality;

    Move from specific to re-useable
  - + Internal rework (PR’s, CR’s)

Scope of the platform

- Functional:
  - + Image and graphics

    processing, analysis, display, manipulation
  - + Films and monitors

    device handling, layout and presentation management, image quality
  - + Patient and image data

    storage, communication, data management
  - + Distributed application

    client-server architecture, system clusters, PMSnet, customization

Scope of the platform 2

- Support:
  - + Hardware

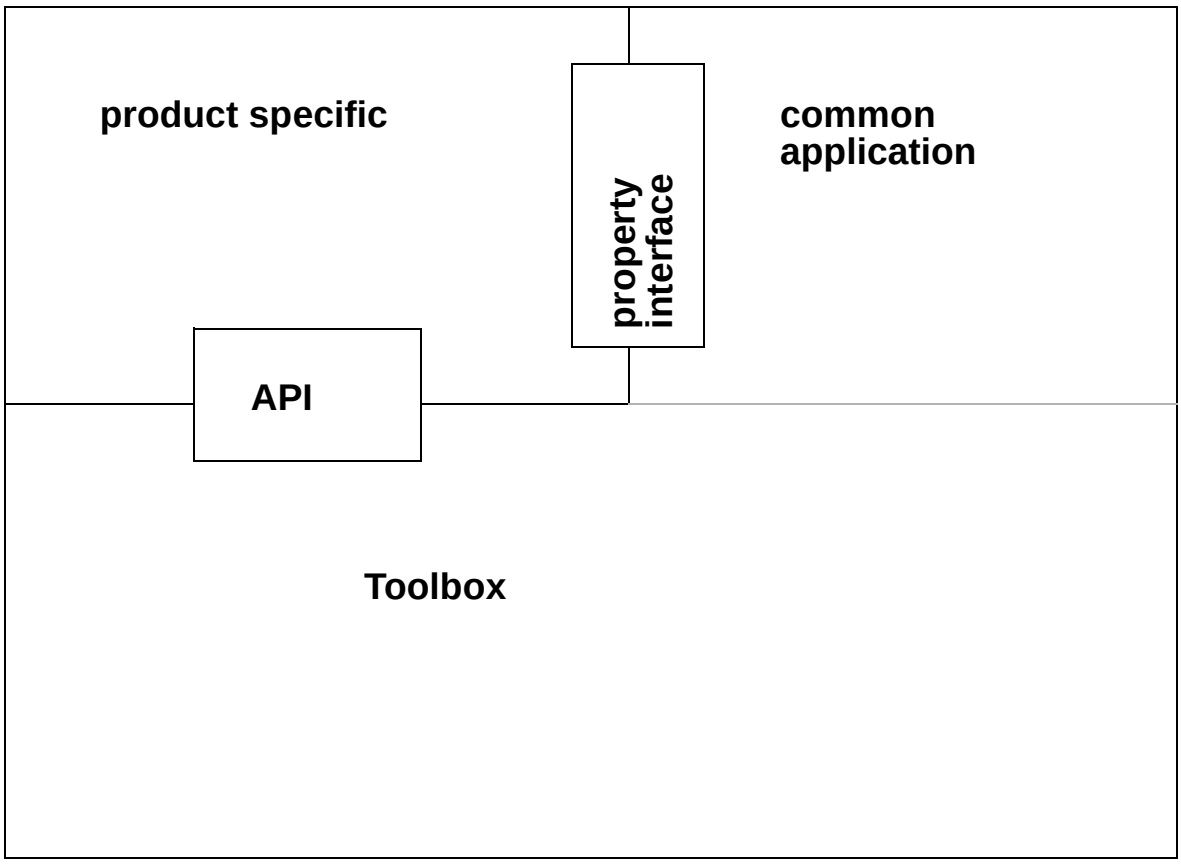
    workstation, optical media, hardcopy units incl interface, standard video in and out, remote control, desk, spinning wheels...
  - + System software

    operating system, drivers, networking, system start up and shutdown
  - + Installation, configuration and service diagnostic SW
  - + Elementary software support

    collections, strings, symboltables, notifications, properties, error handling, etc.
  - + Libraries

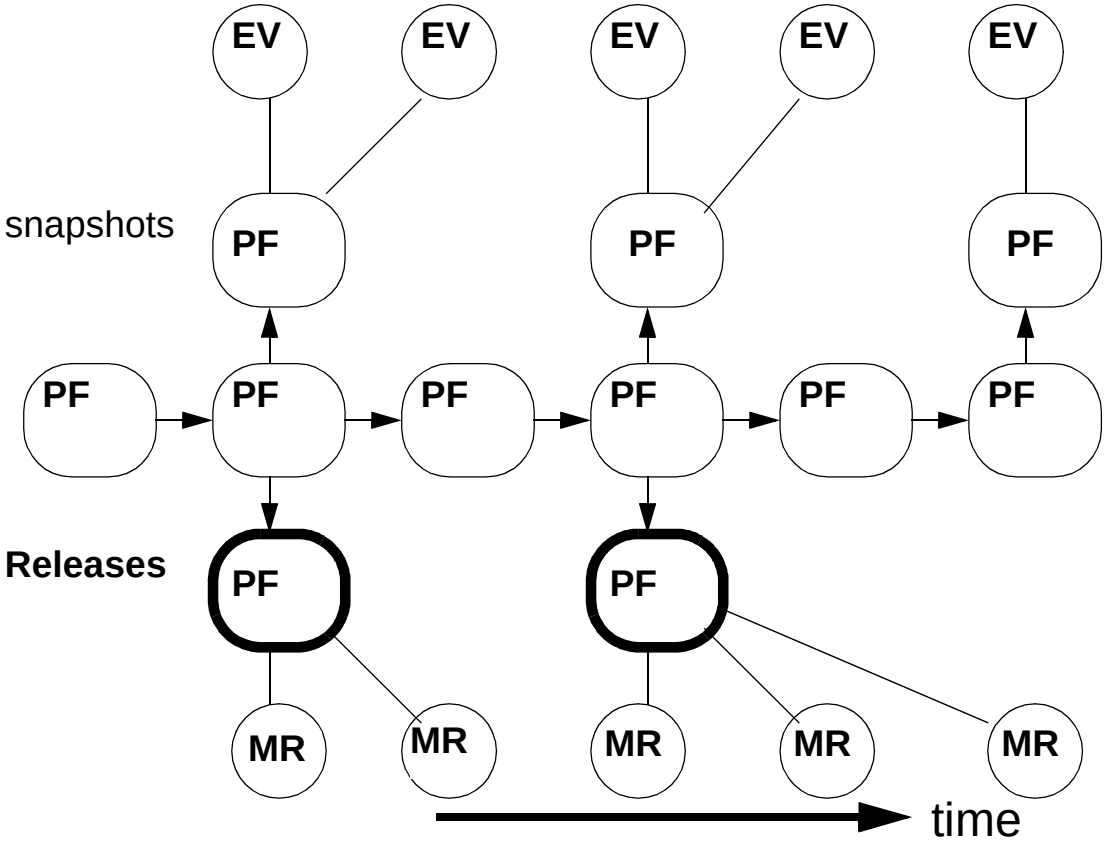
    user interface, screen management, printing, database, PMSdor and PMSnet formatting and protocols, graphics, image processing, etc.

How is the platform used?



- Property interface
  - \+ configure common application
- API (Application Programmers Interface)

Lifecycle and archive structure.



- Intern CDS-Best: snapshots (feedback)
- non CDS products: releases (own lifecycle)
- Old interfaces: allow in principle for transition period of 1 year (after phase 3: introduction of external interface)

Schedule

- 5 manyear/year; 1phase per year
- half year focus on infrastructure
- half year focus on functional extensions
- risks:
  - + cannibalization of resources
  - + subcritical resources, inadequate quality
  - + interference between product and tech. imp.
  - + fast technological changes
  - + fast applicational changes
  - + lack of experience in large scale re-use
  - + education/training

Analysis of CDS software october 92

Current advantages:

- Functionality Easyvision, new and complete
- Experience in:
  - + complete product lifecycle
  - + interoperability of modalities and cultures
  - + resource use
  - + installation and configuration
  - + system engineering and integration
- Flexibility by means of notifications and properties
- Standard workstations and UNIX
- PMSnet, PMSdor
- Pixel manipulation library
- Powerful toolbox
- New technology (OO, networking)

Analysis of CDS software october 92

Requires improvement:

- Interface management (definition, scope)
- Property and notification management
- Data management, relation with data dictionary
- Programming tools and environment (Obj-C)
- Modularity, dependencies
- Geographical separation PMSnet, PMSdor, hardcopy driver development
- First generation tools (e.g. Grey level tool)
- Balancing resource usage
- “Real time” control of UNIX
- Process recovery
- Size of programming staff

Major phases

- Phase 1 (modularization):
  - + Cleanup most obvious modules
  - + First division in separate packages
  - + Equalization of internal data model and PMS Data Dictionary
  - + PMSnet, PMSdor, complete new
  - + analysis (modularity, notifications, properties)
- Phase 2 (Interfacing):
  - + Further modularity restructuring
  - + Prototyping interface
  - + Advanced development interface
  - + Prepare external interface
  - + Explore real time extensions(e.g. Threads)

Major phases 2

- Phase 3 (Internal benefit, standardization)
  - + Explore C++
  - + Explore X
  - + Implement 1D viewing
  - + Use external interface
- Phase 4 (external benefit)
  - + Decide on C++, X use
  - + Use platform by non CDS clients

Current status june ’93

- Modularity
  - + CDS pack independent of rest SW
  - + SW archive divided in “groups”, dependencies are analyzed
- Property management
  - + file structure streamlined
- SPI support library
  - + Implementation finished
  - + Increased performance and functionality
  - + Much less code
  - + Configuration simpler
- PMSdor, PMSnet redesign and coding planned
- Solaris 2: masterplan
- HP: viewing ported, plan for product porting

- Cardio graphics:
  - + additional functionality
  - + “cold” graphics removed
- Data model:
  - + XDR based self describing object format
- Data base:
  - + improved performance
  - + support for spooled services
- Process structure:
  - + import and export servers-> network server
  - + spoolers and UNIX command server removed
- Memory usage:
  - + ASW: 20% reduction (UNIX 20% increase)

Learning curve

june 1991, R0.2:

- toolbox: viewing, user interface, database
- application: test vehicle, viewing only, no modality knowledge, hardcopy in preparation
- system: tuned OS

sept 1992, R1.0:

- toolbox: + spooler/server + hardcopy + DOR support
- application: R/F based view/print/store/link
- system: installation, configuration, start up, tuned OS, sw keys, service mode

may 1993, R1.2:

- application: + limited vascular + ACR/NEMA picture export

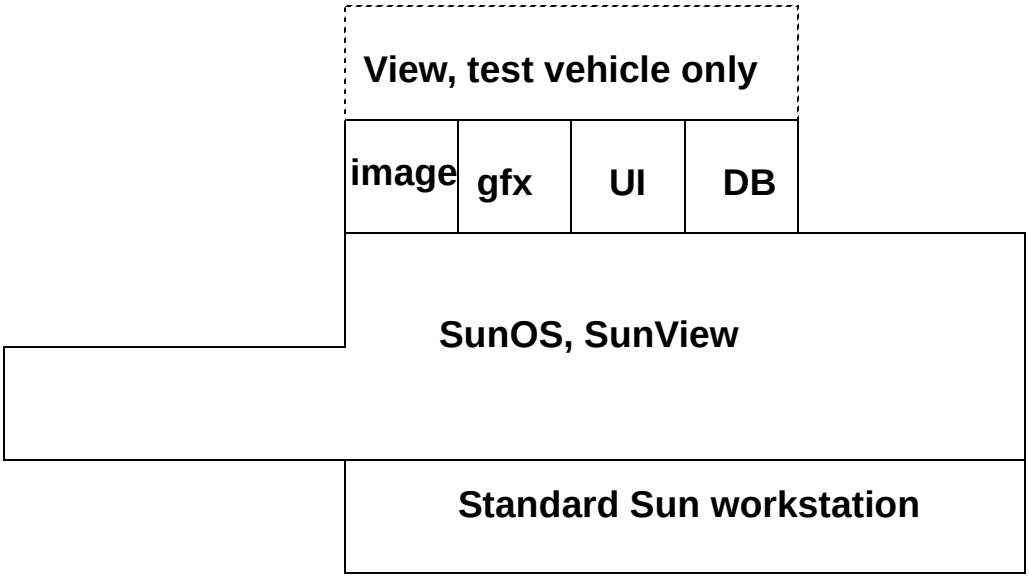
june 1994, Easyslice R1.1, Easyvision R2.1:

- toolbox: major cleanup, modularization, performance improvement
- application: MR and CT, Bolus chase, stenotic sizing in vascular (first application package), Cardiac extended communication, user interface tuned to application (facilities)
- system: Solaris 2, new HW, some cost price reductions

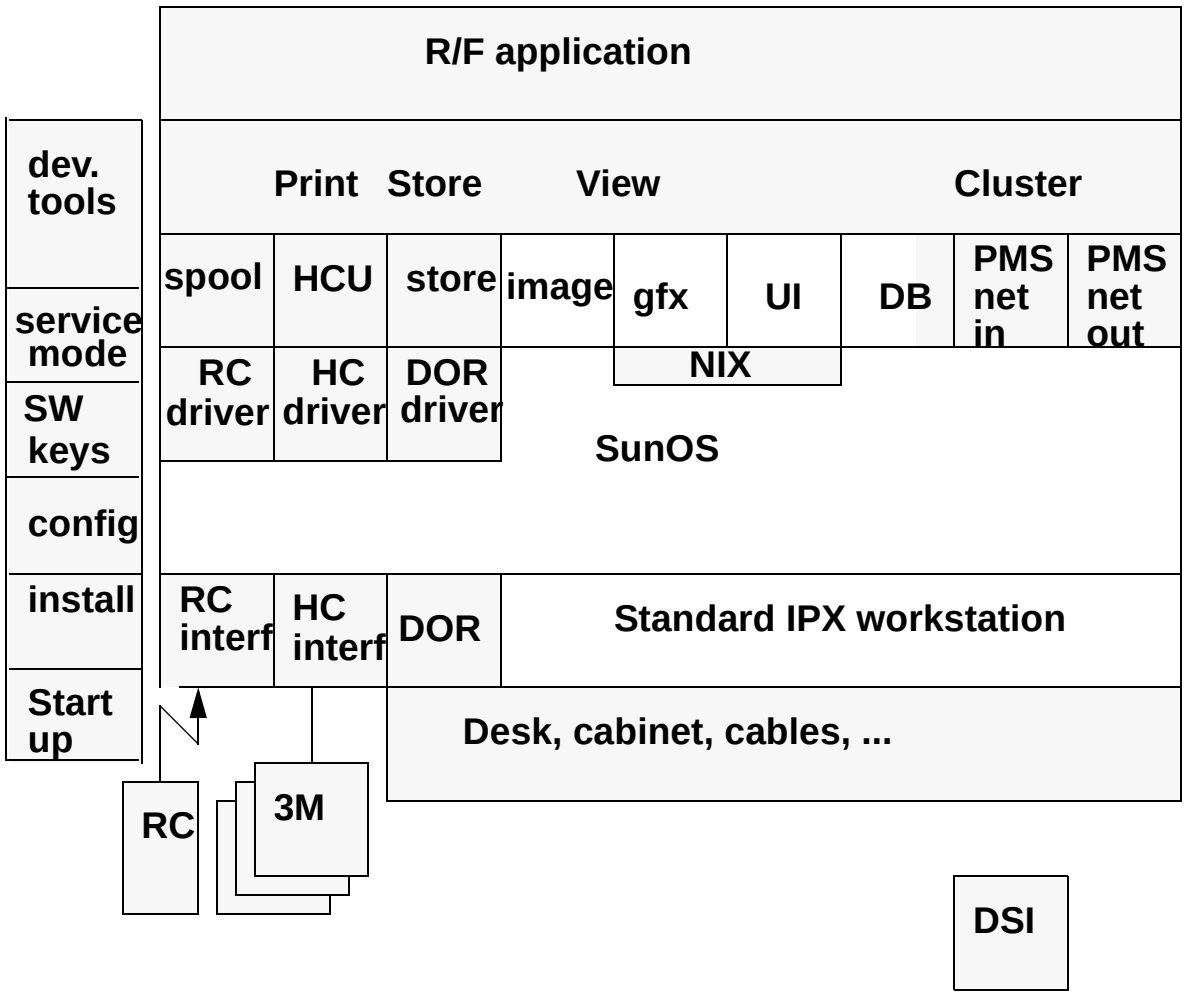
Next learning directions:

- toolbox: further cleanup, interface management, consolidation of product extensions 1993/1994.
- application: PCR, digitized film, US(?), more application packages, interface to other hospital functions (RIS, IMAC, ...)
- system: dedicated products (print only, view only, etc), other HW platform(?)

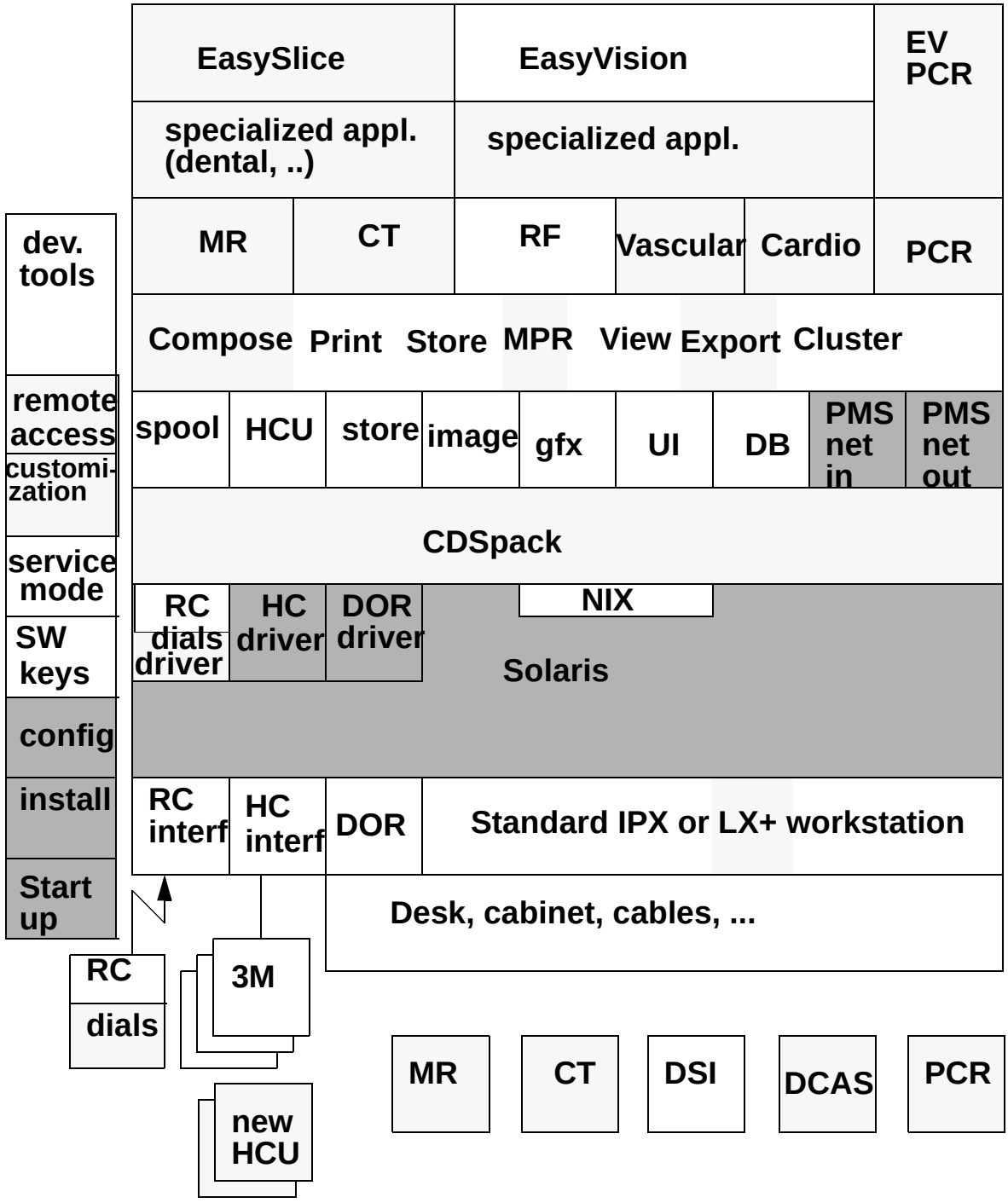
september 1991



september 1992



june 1994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dev. tools
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UI
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PMS net in
PMS net out
CDSpack
service mode
SW keys
RC dials driver
HC driver
DOR driver
NIX
Solaris
config
install
RC interf
HC interf
DOR
Standard IPX or LX+ workstation
Start up
Desk, cabinet, cables, ...
RC dials
3M
new HCU
MR
CT
DSI
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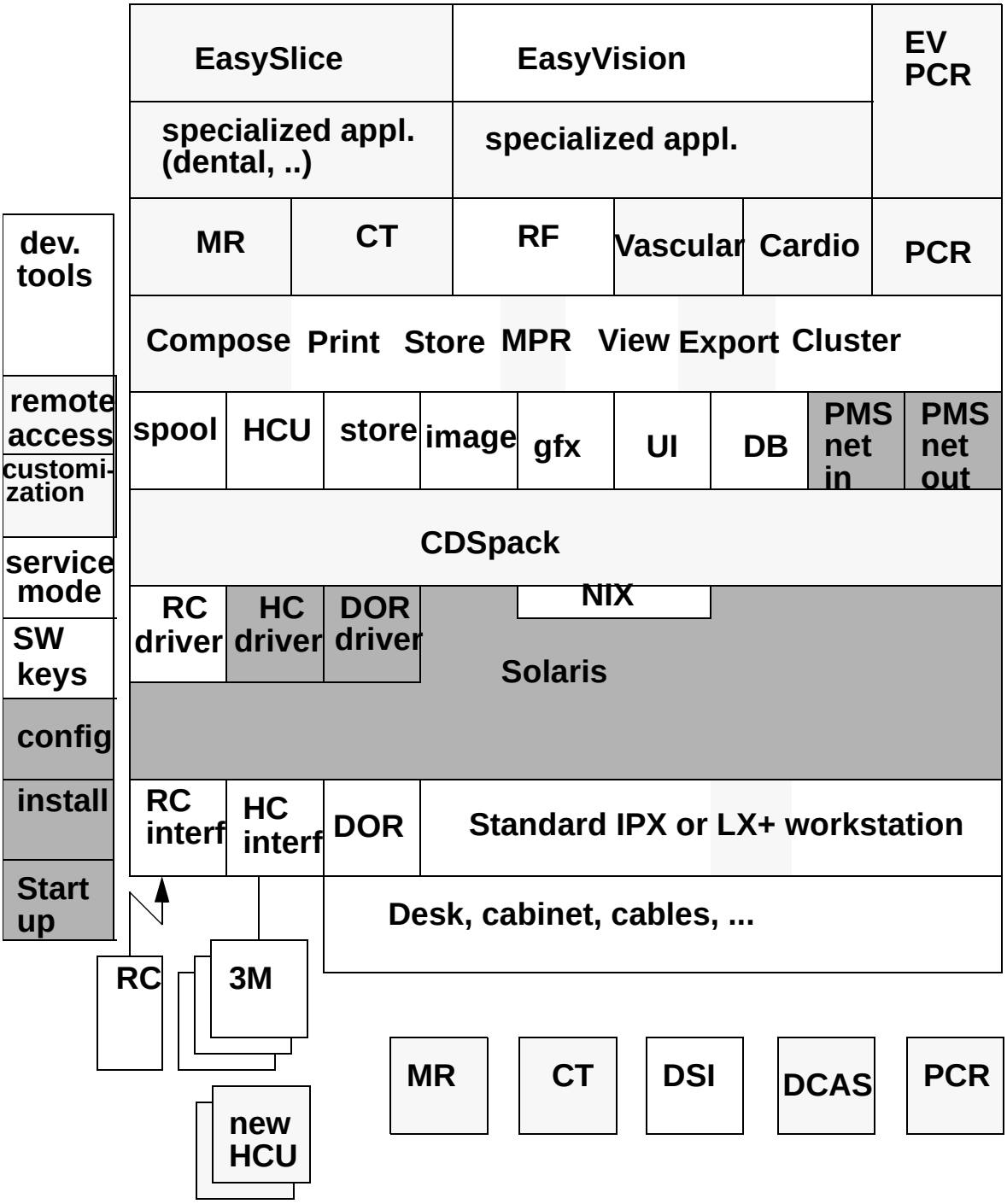
PCR

june 1994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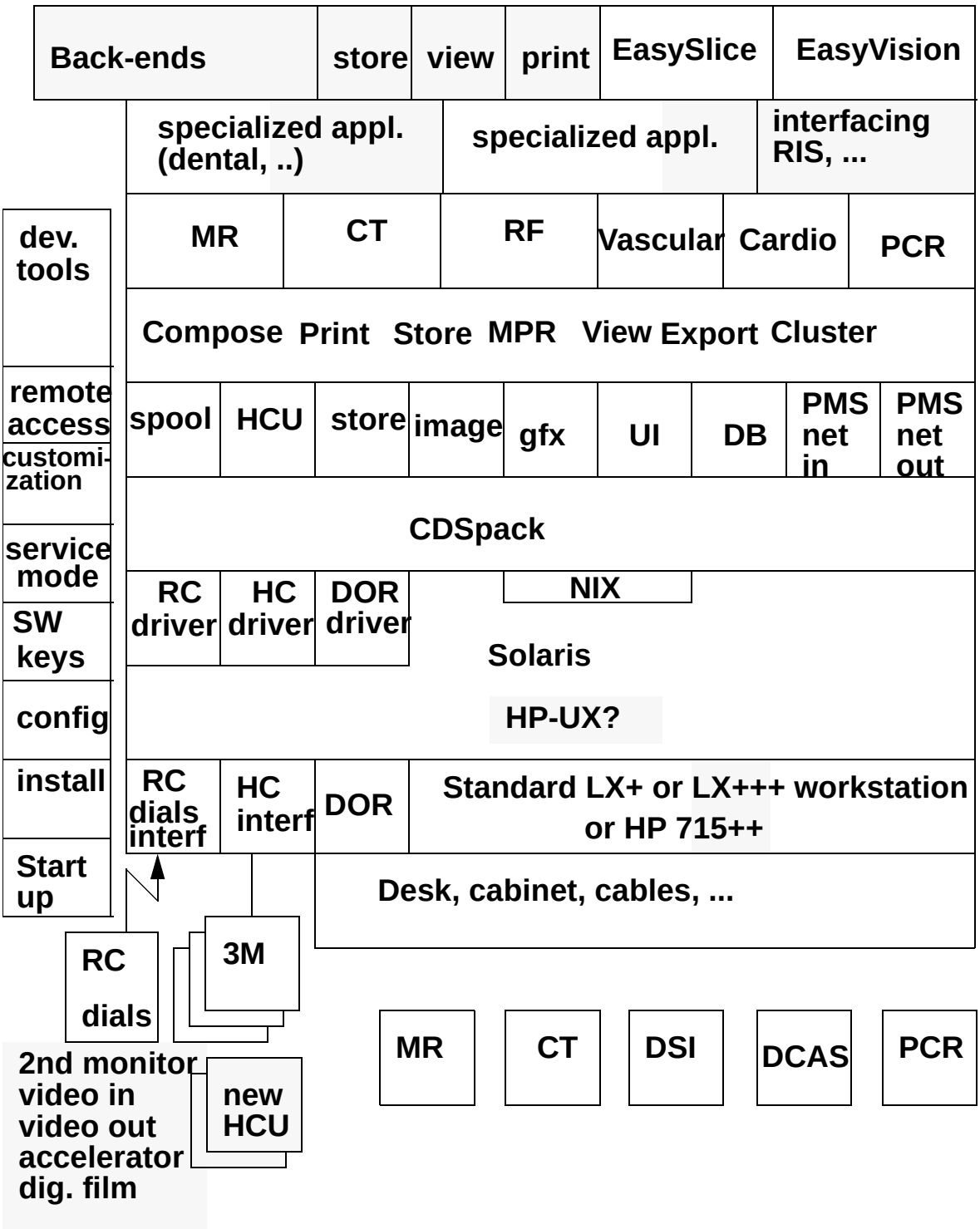
1995/1996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