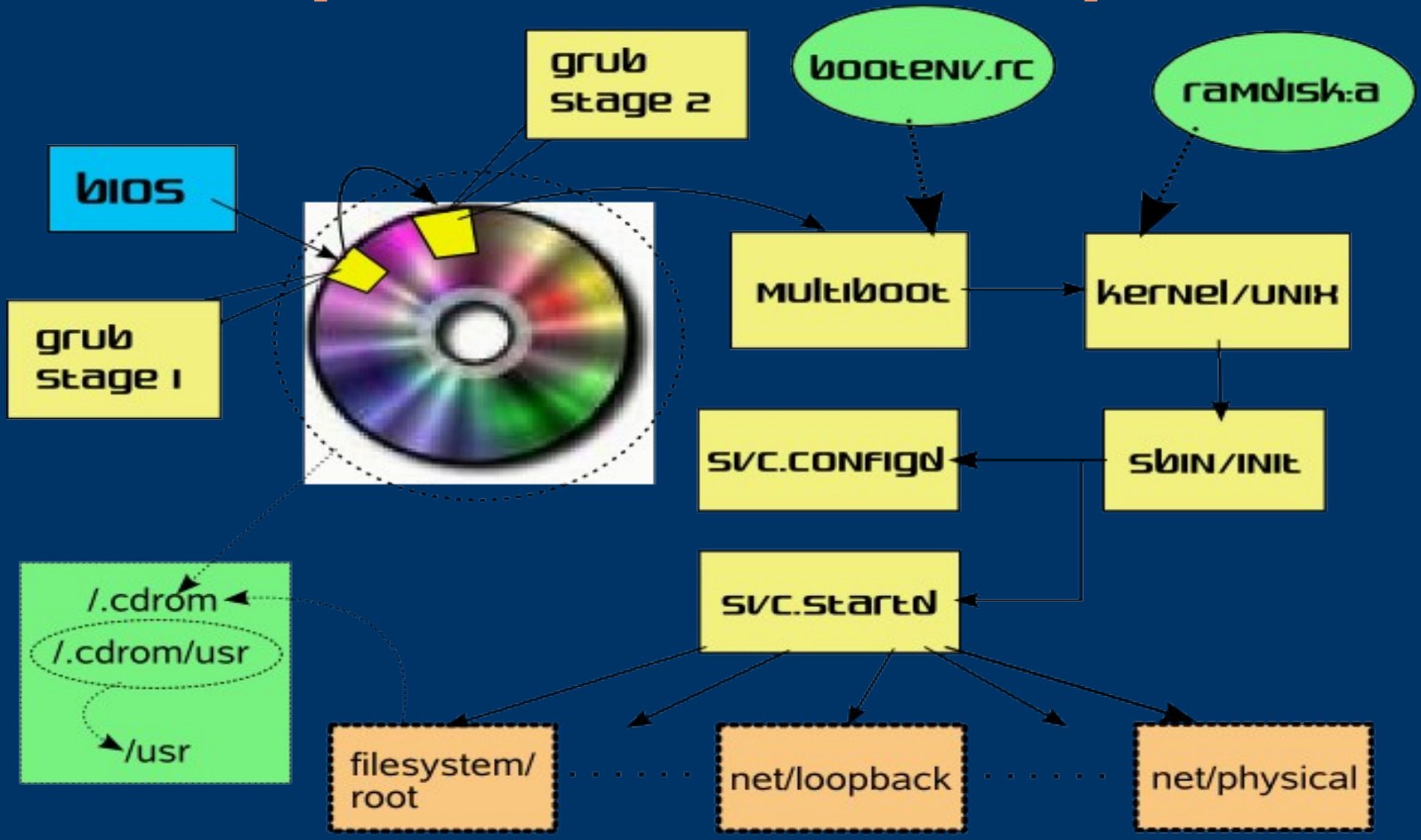
Creating an OpenSolaris Distro
BeleniX Background

- Lack of OpenSolaris awareness in India
- Need for a LiveCD
- Lack of information and documentation at the time
- Several distros is good for OpenSolaris
- Great opportunity to learn/experiment
- Targeted as a Community Project
- We welcome collaboration/participation
- Open-Source and intent is to contribute upstream
- Free to distribute, use, modify, remaster etc.

Creating an OpenSolaris Distro First Steps

- Understand the boot architecture
- What is needed for CDROM boot
- OpenSolaris already has the boot components
- Understand LiveCD technology
- Looked at Linux LiveCDs, esp KNOPPIX
- Differences in Linux boot and OpenSolaris boot
- Lesson: A good LiveCD can help in popularity

Creating an OpenSolaris Distro
OpenSolaris Bootup



Initial OpenSolaris boot from cd, simplified

Complete Document: http://belenix.sarovar.org/behind_the_scenes.html

Creating an OpenSolaris Distro Problems

- When to mount the CD
- How to access the CD early on in boot (bootchart)
- SMF Configuration issues: repository.db
- Inetd's dependency on ksh via wordexp(3C)
- ShowStopper: Missing Math Library (available now)
- Reduce space usage on ramdisk
- Device support: Pre-populate /etc/driver_aliases
- Device support: Include open-source drivers
- Basic /etc/* configuration files
- Numerous minor nits: DHCP, termcap db, vold

Creating an OpenSolaris Distro Problems (Contd)

- Finding Time.
- Initial work requires a lot of effort
- Benefit: Understand the Big Picture
- Use quality branded CDRW media (save money!)

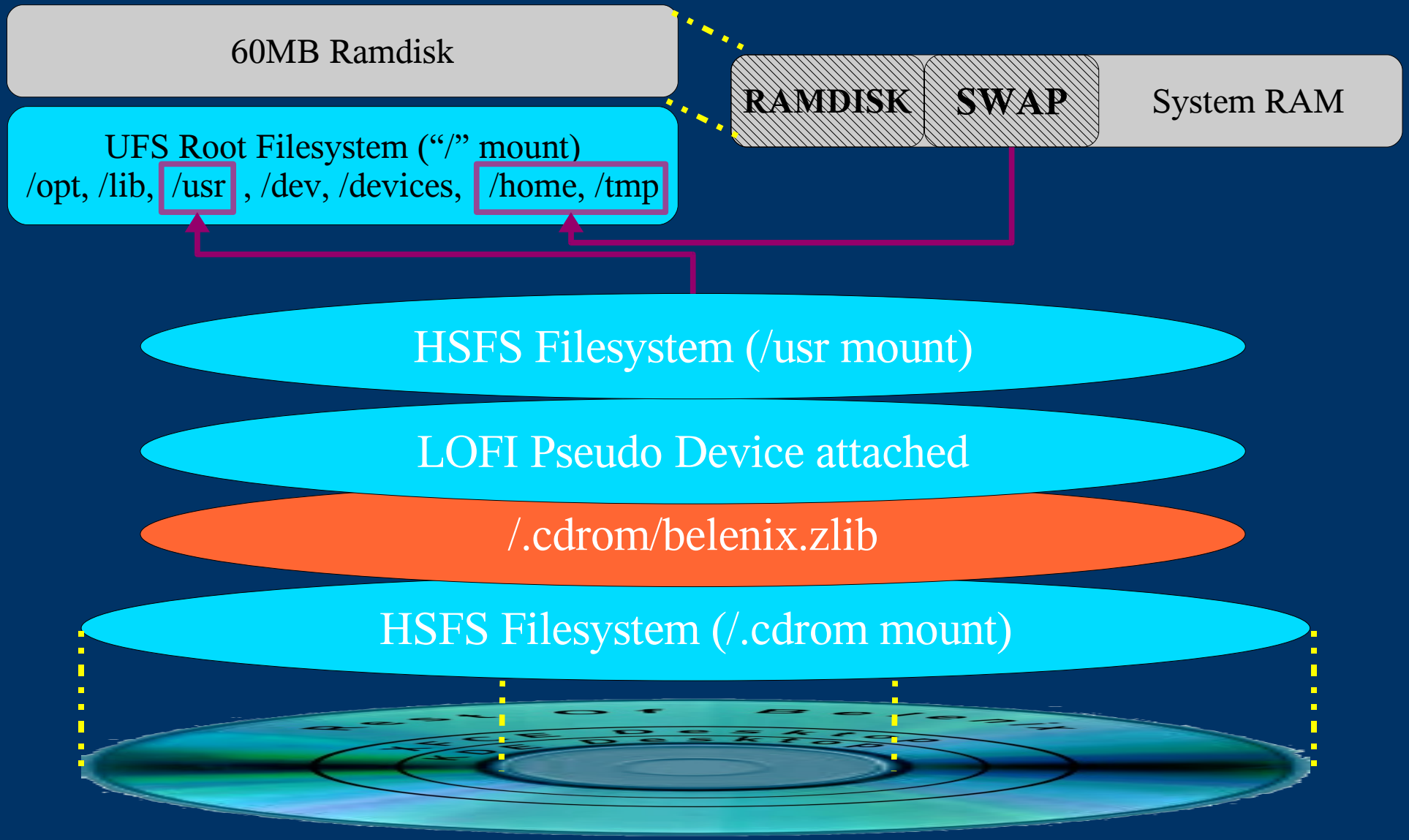
Creating an OpenSolaris Distro Other Issues

- How much can we cram into a 700MB CD
- Boot from CD is quite slow
- It takes ages to start a lightweight GUI desktop
- A CDROM is bad for random access
- SMF parallelism Aggravates the problem!
- What about GNOME or KDE

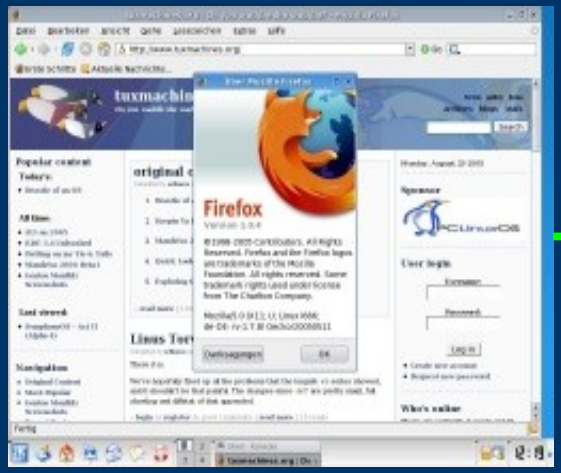
Creating an OpenSolaris Distro Other Issues: Solutions

- Learn from others like KNOPPIX and improvise
- This is a benefit of an open community
- Introduced zlib compression in lofi
- Helps pack in 1.8 GB of data in one 700MB CD
- Improves I/O: more data transferred per read
- Reduces CDROM head movement/seek time
- Analyse GUI desktop file access pattern
- Arrange desktop binaries/files at the beginning
- DTrace helps
- Reduce number of SMF services started
- Implement I/O Scheduler

Creating an OpenSolaris Distro Filesystem Layering



Creating an OpenSolaris Distro Transparent Decompression



disk.png, 0, 2048

Vnode Layer

HSFS: hsfs_read

BLK DEV LYR

HSFS: hsfs_getpage

LOFI Block Driver

Return Page from Decompressed Block

Decompressed Block

Decompression routine

Loopback file read

Compressed Block

HSFS: hsfs_getpage

HSFS: hsfs_read

Vnode Layer

belenix.zlib, xx, yyy

Creating an OpenSolaris Distro CDROM Layout

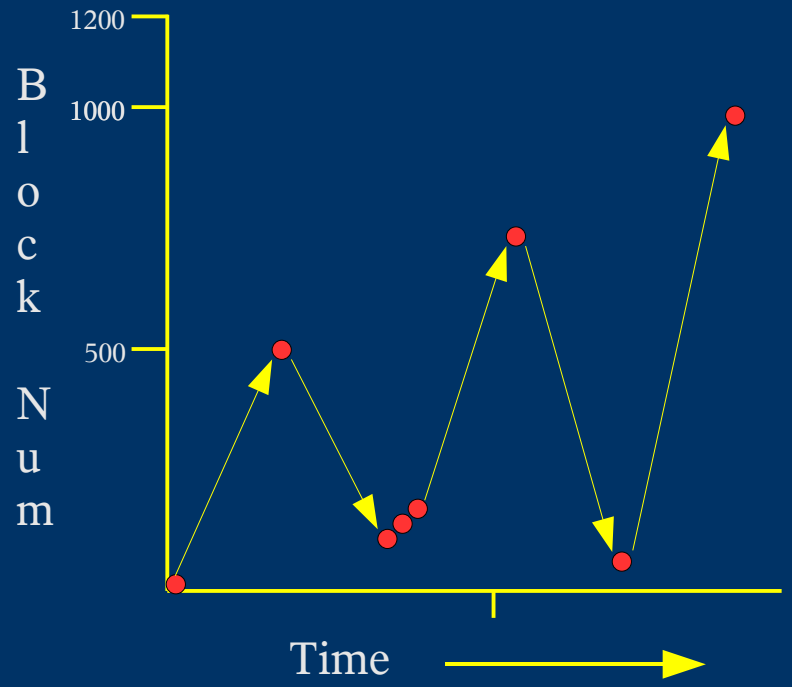
Creating an OpenSolaris Distro I/O Scheduling and Readahead

- CDROM Access time is high
- Access time = Seek Time + Rotational Latency
- Seek Time is major component
- Rotational Latency is less important: 40X – 52X
- Random access aggravates seek time issue
- I/O Scheduler attempts to optimize seeking
- Serialize and re-order I/O requests in a pipeline
- BeleniX implementation uses CLOOK algorithm
- Coalesce multiple adjacent I/Os into one I/O
- Readahead benefits sequential access
- Read extra blocks from disk in the background

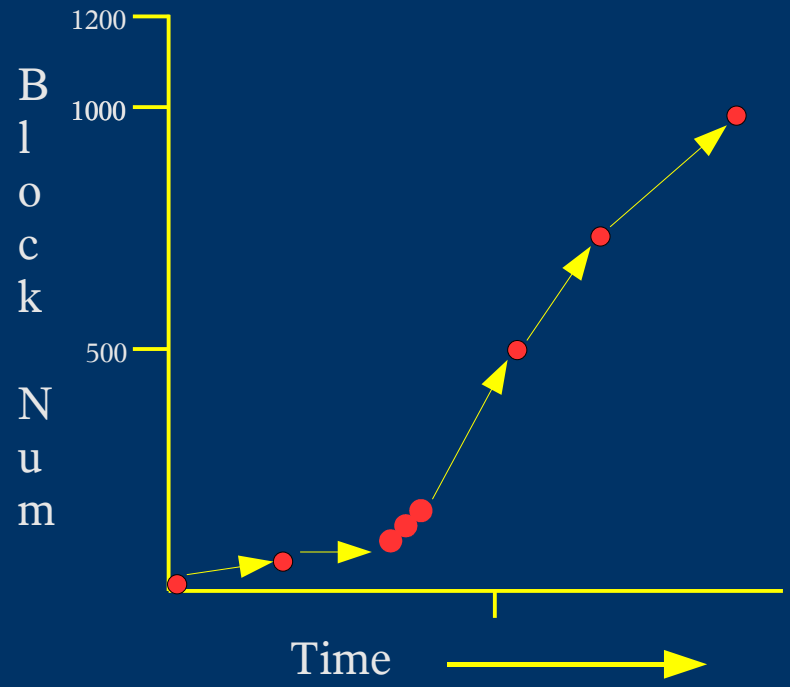
Creating an OpenSolaris Distro I/O Scheduling Benefit

Example: Requested disk blocks – 10, 500, 100, 110, 120, 720, 50, 1000
Disk Block Size = 10 bytes
Reordered, Coalesced Disk Blocks – 10, 50, 100-110-120, 500, 720, 1000

Disk head seek without I/O Scheduling



Disk head seek with I/O Scheduling



Creating an OpenSolaris Distro Readahead Benefit

- Idea is to read more data than requested and cache
- Good for sequential access.
- Ideal case: Application always gets cached data
- Ideal case: Application does not experience I/O lag
- Good for playing Audio/Video files, installers
- Not of much use for random access
- Need to detect sequential access
- BeleniX hsfs detects 4 consecutive adjacent reads

Creating an OpenSolaris Distro Summary

- Live bootable media is good for popularity
- Community collaboration helps
- Lots of commitment/effort required at least initially
- Community expects, provides constructive comments
- Live media has potential: ubiquitous computing
- Install to harddisk, packaging is a must however

Creating an OpenSolaris Distro Summary (Contd)

- Device support is a primary area for OpenSolaris
- Need quality CDRW media and DVD-RAM drive
- Compression even helps harddisk performance
- Any Unix developer **must** learn truss
- DTrace makes life easy on OpenSolaris
- Healthy collaboration possible with *BSD
- Math library changes being given back to FreeBSD

Creating an OpenSolaris Distro Some Pointers

BeleniX documentation/links page:
http://belenix.sarovar.org/belenix_docs.html or
http://www.genunix.org/distributions/belenix_site/belenix_docs.html

OpenSolaris Communities page:
http://www.opensolaris.org/os/communities/#all

OpenSolaris for beginners & advanced users:
http://www.learningsolaris.com

Some initial BeleniX evolution described at:
http://blogs.sun.com/moinakg