

# makefile Errors

## vs.

# Additional Hardware Budget Needs in FY2001

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### **ABSTRACT**

An accumulation of errors in the `makefile`'s used to build HP-UX in the ClearCase environment has been preventing such builds from generating the correct output files in ClearCase running on HP-UX 11.0 View Servers. [Limited fixes are imminent](#), but the problems will continue to prevent HP-UX from being built in both a *mixed* 10.20/11.0 ClearCase View Server environment AND in any 11.0 View Server environment (mixed or pure) for *older, unfixed* release lines, such as those used to replicate customer problems and create HP-UX patches. The effect of these problems is that the labs that develop HP-UX cannot gradually deploy, in their current ClearCase rings, newer and faster HP hardware—the N- and L-class servers—for use as View Servers. Instead, a second, duplicate ClearCase hardware environment, or *ring*, must be set up, with a complete set of VOB replicas and enough View Servers to handle the needs of developers able or wanting to work in that faster environment. For EIAL—particularly since we have 3 separate (and fire-walled) regions, for HP, NEC, and Hitachi engineers—this duplication of hardware and corresponding infrastructure would require an unanticipated capital outlay in FY2001 of somewhere between \$500,000 and \$875,000. It also nearly doubles our workload for ClearCase administration and SCM tools/nightly builds, and it adds significantly to the ES workload as well as the space problems we have in our production lab.

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*Purpose:* To describe a problem with the `makefile`'s used in various release lines of the HP-UX source code as maintained in ClearCase (in the UXSCM Program) and how it could significantly affect the capital budget and ES/SCM staff workload for EIAL in FY2001.

*Audience:* EIAL management.

# 1. The Problem

Many `makefile`'s in our HP-UX source tree are coded with mistakes that have started to cause significant problems for the UXSCM Program (the infrastructure used by the HP development labs using ClearCase to develop HP-UX). Some of these mistakes critically affect the ability of EIAL's ClearCase environment (currently our users are on K-class servers) to run on HP's newer and faster hardware (like the N- and L-class servers). These mistakes are mostly of two types:

- Not using compiler options for generating code in a way that ensures that the object files built for the same target but on different build hosts (i.e., 10.20 and 11.0) are the same. Without this, a 100% complete set of regression tests for any baseline on a release line must be run when the build host is 11.0, even when the same build passed all tests when built on 10.20. This is a by-product of compiler option defaults which assume the target is the same as the host.
- Not using the ClearCase-based build environment (BE) to produce all object files, including intermediate executable objects—those used in the build process to produce final HP-UX objects. If a `makefile` uses the build host's own compiler to produce code, this code can cause several problems during ClearCase wink-in (e.g., 11.0 executable files winked into a view running on 10.20 will not run).

The first problem currently prevents a ClearCase build of HP-UX from succeeding when the build machine is running 11.0. This problem is being addressed by ongoing work being done in Cupertino; when that work is completed, it will be possible to build HP-UX in ClearCase on 11.0-based View Servers, but with 2 restrictions:

- The ClearCase region must contain only 11.0 View Servers (no mixing of 11.0 and 10.20 View Servers).
- The problem will be fixed for only a limited set of the latest code: the latest *baseline* on the `i80` and `r11ros` release lines—the first 2 baselines that pass the full tests. The baselines that follow them will be considered to work as well since the `makefile`'s are under review by the same folks who are doing this work. However, if work was necessary to make either of the two baselines above work correctly on the 11.0 baseline then prior baselines on the respective release line(s) will be known not to work. And, note too that older baselines on those two release lines, as well as other release lines, will not have been tested and so must remain suspect.

The second problem occurs once the first problem is “fixed”. When those two fixed baselines can be built on 11.0, they cannot be built in any ClearCase ring with a mixed set of 10.20 and 11.0 View Servers—they must be built in an 11.0-only ring. Additional `makefile` fixes and regression testing will be required to allow ClearCase builds of HP-UX to work in a mixed 10.20/11.0 ClearCase ring; such work may greatly exceed the work needed just to fix the first problem.

In addition, note that the `makefile`'s for the HP-UX `libc` code are in a worse state than those for other HP-UX code. Since `libc` was one of the first HP-UX components put into ClearCase, its `makefile`'s have the above 2 problems as well as a few others that complicate the problem of building it on an 11.0-based View Server. And `libc` code is currently in the process of being moved to India for maintenance, further complicating the issues.

Finally, this `makefile` problem is part of a somewhat larger problem involving the “build environment” used for building HP-UX: the build tools, `makefile` rules, and their interaction. There are other specific problems in the build environment that would need addressing if the `makefile` problems were solved, but this topic would have to be addressed in a separate document.

## 2. Implications

The implications of these problems, as long as they remain unaddressed, are several:

- No ClearCase View Servers running HP-UX 11.0 may be added to a current ClearCase ring running with View Servers at 10.20. Thus, no N- or L-class servers may be used as View Servers in a current ring.
- To use the newer, faster N- and L-class servers as ClearCase View Servers, they must be in a ring that has only 11.0 View Servers. This means that either current 10.20 rings need to be upgraded *in one downtime* to all 11.0 (not a realistic option—see the next item), or a 2<sup>nd</sup> ring has to be setup, with a complete set of VOB replicas and as many View Servers as are needed to meet the needs of developers able and wanting to work on an 11.0 View Server.
- As long as any developer has a need to access a release line in which the `makefile` problems have not been fixed or shown by testing not to exist, then a 10.20 View Server must be available. The set of cases in which a developer needs to access such release lines includes, of course, any need to do patches of HP-UX code for releases going back from [I believe] 11.10: thus CPE work for 11.10, 11.01, 11.0, and 10.20 all require a View Server running 10.20. There may also be other reasons for needing to use a 10.20 View Server to access code (the `libc` maintenance work is certainly one).
- Since CPE work on those releases is likely to continue for several years, UXSCM partner sites will be required to maintain “double” rings if they do any CPE work *and* want to upgrade to newer HP server hardware for performance, cost, and space reasons. (A site could choose to stay at 10.20 and maintain just a single ring as long as they are content to run on K-class hardware).
- It is likely that having two rings, one at 10.20 and one at 11.0, will cause developer confusion over time. Developers will need to be very careful that they do any “old baseline” work in the 10.20 ring and their other, newer, work in the 11.0 ring. It is likely inevitable that developers working in such an environment will eventually start some work in the wrong ring and lose valuable time moving that work to the “correct” environment.

### 3. Impact on EIAL

The impact of this issue on EIAL is significant because we have 3 separate ClearCase regions and had not planned on doubling our hardware capacity in 2001:

Region	VOB Servers	View servers	Total servers
EIAL-HP	4 (3 for UXSCM)	6	9
EIAL-NEC	2	3	5
EIAL-Hitachi	1	2	3

And the impact was unanticipated and so is causing concern because of the effect on our capital budget, on ClearCase and general ES administration overhead, and on power, space, networking, and AC requirements for our production lab. Since we upgraded all of our VOB Servers in the summer of 2000 (4 to N-class and 2 to K-580), our plan for capital outlays in FY2001 had been targeted at View Server growth and enhanced disk storage. Specifically, we planned on:

1. offloading baseline build and tools work to SCM-only View Servers;
2. allowing for 20-30% growth in ClearCase usage (about the growth rate we have had for the past 2 years), mostly through adding some L-class machines as View Servers, selectively retiring the oldest K-class machines, and moving recycled K-580 VOB Servers to uses as View Servers;
3. significantly enhancing the capacity and manageability of our disk storage systems with new disk and I/O hardware.

But with the likely need to setup a 2<sup>nd</sup> ring for our 3 regions (e.g., Hitachi does DLKM patches for 11.0 and so requires a 10.20 ring; the exact needs of NEC are still TBD), our capital budget has to be re-directed to more server hardware. Assuming the following approximate internal costs for new hardware (based on our most recent needs and orders):

9000 Series Server	Configuration	Cost	Attached AutoRAID	Total Cost
L-2000 <i>(for View Servers)</i>	4 CPU, 4 GB RAM	\$20,000	\$25,000	\$45,000
N4000-36 <i>(for VOB Servers)</i>	4 CPU, 8-16 GB RAM	\$40,000	\$25,000	\$65,000

and assuming we only need 2<sup>nd</sup> rings for the HP and Hitachi regions and can get along with 4 instead of 6 View Servers in the 2<sup>nd</sup> HP ring for 2001, the minimum requirement is for 4 N-class and 6 L-class, which totals \$530,000. If we do indeed have to do a 2<sup>nd</sup> ring for NEC, and if we allow for all 6 L-class machines for the 2<sup>nd</sup> HP region, then we “need” 6 N-class and 11 L-class, which totals \$885,000.

I put “need” in quotes in the previous paragraph for three reasons. First, there is clearly some split of developers between the 10.20 and 11.0 ring, and the latter may not need to grow to the size of the former all in 2001. Secondly, the exact growth rates of our ClearCase usage are not very predictable given our current HP-UX developer staffing, and there is the possibility of additional work being done by our partners, depending on current negotiations. Lastly, we have 3 or 4 L-class in house or on order for FY2000 (part of our View Server growth plans for 2000), and 1 N-class allocated for ES has recently become available for use as a ClearCase machine; these machines reduce capital needs from the above figures by about \$200,000, to \$330,000 and \$685,000 respectively. Rounding off these numbers—since this is imprecise anyhow, for the reasons cited—we get an additional FY2001 server hardware budget impact of somewhere between \$300,000 and \$700,000.

The exact impact on production lab power, space, AC, and networking are still TBD. Initial feedback from the ES staff included sighs for the amount of work involved as well as an estimate of \$175,000 additional capital for lab infrastructure: a PDU, networking wiring and ports, and racking hardware. **Thus the total unexpected capital outlay for EIAL for FY2001 is between \$500,000 and \$875,000.**

The *workload for SCM and ES administration will also probably double*, and the ramifications of this on headcount also must be addressed. Sheer numbers of machines makes a difference, but in addition, the networking firewall setup for the partner regions adds a level of effort and possible problems that other sites do not have.