

# Patching and Upgrading Tru64 UNIX and TruClusters

**Martin Moore**

Team Leader, Tru64 UNIX Support  
HP Services



# Session Topics

- Patching Tru64 UNIX and TruClusters
  - Background info
  - Best practices
- Upgrading Tru64 UNIX and TruClusters
  - Overview
  - Best practices
- New Hardware Delivery (NHD) kits

# Types of patches

- Customer-Specific Patch (CSP)
  - Addresses a reported problem for a specific customer
    - Customized for customer's system and patch level
    - Made available only to a specific customer
  - Unit testing performed
  - Shipped in *dupatch/setld* format
  - Rolled into a future release patch kit

# Types of patches (cont.)

## ■ Early Release Patch (ERP)

- A single patch available to all customers in response to a critical or widespread problem, such as:
  - Data integrity
  - Security
  - Detrimental to system operation
- Uses CSP packaging mechanism with slightly different documentation
- More extensive testing than CSP
- Available via patch web/FTP site
- Accompanied by Product Advisory and/or CERT advisory
- Rolled into a future release patch kit

# Types of patches (cont.)

## ■ Release Patch Kit

- General distribution of patches
- Available to all customers via FTP/web site:
  - <http://www.support.compaq.com/patches/> (but moving to <http://www.itrc.hp.com> in the near future)
- Testing is a scaled version of a full functional release
- Two types: Initial Patch Kit (**IPK**) or Aggregate Patch Kit
  - IPK contains fixes to prevent upgrade regression (forward porting of existing patches not in new version of O/S) plus fixes for new problems found in release qualification testing
  - Aggregate kits (subsequent base level kits after IPK) contain **cumulative** fixes for problems reported by customers or HP
  - Both may also include new functionality

# Patch distribution model

- Old Model:
  - Manufactured and released serially
  - Distributed on a 6-9 month cycle
  - Order of priority dictated by Tru64 UNIX Support Engineering per customer demand
  - Supported 3-7 patch kits per base level (delivered kits for all supported versions on all base levels)
    - 7 variants for BL16
    - 6 variants for BL17
    - 3 variants for BL18

# Patch distribution model

- New Model
  - Ship 1-2 kits per base level
    - Deliver kits for releases with a high volume of incoming problem reports on a 90 day cycle
    - Deliver kits for releases with low volume less frequently
  - Deliver two patch kits simultaneously (or close to it)
  - Decrease the length of time between base levels
- All release patch kits, aggregate and IPKs, go through an extensive test matrix before being released
  - Scaled version of full quality testing that is performed in base OS/TruCluster development releases

# Patch roadmap

- Recent and *forthcoming* patch kits
  - BL20: V5.1A pk3 (8/28/02), V5.1 pk6 (2/13/03)
  - BL21: V5.1B IPK (12/29/02), V5.1A pk4 (2/18/03)
  - BL22: V5.1B pk2 (5/6/03), V4.0G pk4, V4.0F pk8
  - BL23: V5.1A pk5
- Patch roadmap viewable at:  
<http://www.tru64unix.compaq.com/docs/patch/roadmap.html>



# Supported versions

## ■ Currently Supported Releases

- V4.0F/TCR1.6 (Prior Version Support thru 30-Sep-2005)
- V4.0G/TCR1.6 (PVS thru 30-Sep-2005)
- V5.0A/TCR5.0A (PVS thru 30-Sep-2003)
- V5.1/TCR5.1 (PVS thru 29-Feb-2004)
- V5.1A/TCR5.1A (Standard support ends 29-Feb-2004; PVS from 1-Mar-2004 thru 28-Feb-2005)
- V5.1B/TCR5.1B (Standard support through EOL)

[http://www.compaq.com/services/software/ss\\_pvs\\_se\\_amap.html](http://www.compaq.com/services/software/ss_pvs_se_amap.html)

# Patch kit paradigm

- All patches are “a la carte”
  - Install/Remove all patches or selected patches (within limits; some patches depend on others)
  - HP strongly recommends installing all patches
- Patches can be installed as reversible or nonreversible
  - Reversible
    - Consumes additional disk space
    - Patches can be removed recursively
    - Strongly recommended
  - Nonreversible
    - Additional disk space not needed
    - Patches cannot be removed

# Patch kit naming

- Release kits (as of BL18)

- Example:

- OS Product|Version|Base Level|KitType|Kit#|-MfgDate

Patch kit file **T64V51B18AS0003-20011020.tar** is read as:

Tru64 UNIX (and TruCluster) software (**T64**)

Version 5.1 (**V51**)

Base level 18 (**B18**)

Aggregate (selective installation) patch kit (**AS**)

Patch Kit 3 (**0003**)

Manufactured on October 20, 2001 (**-20011020**)

# Patch kit naming (cont.)

- ERP's and CSP's – Existing style
  - Example: **T64V51AB21-C0020100-12345-ES-20030611.tar**
    - **T64V51AB21**: Product, version, base level (Tru64 UNIX V5.1A, BL 21)
    - **C0020100**: Patch number of one patch included in kit (patch 201.00) – kit may or may not include other patches
    - **12345**: Unique kit ID number (unique for this CSP)
    - **ES**: Kit type identifier
      - M = Manual patch (not installed with dupatch)
      - E = ERP (not present implies CSP)
      - S = Security patch
    - **20030611**: Manufacture date (June 11, 2003)
  - The kit number (12345 in this example) is the key field to uniquely identify this patch kit

# Patch kit naming (cont.)

- ERP's and CSP's – New style (late 2003)
  - Example: **T64KIT0012345-V51AB21-ES-20030611.tar**
  - Minor changes from previous style
    - Individual patch number dropped
    - “KIT” and unique kit number moved to first field
  - Kit type identifier may include “C” to identify CSP
    - C and E mutually exclusive

# Patch documentation

- Publicly available at <http://www.tru64unix.compaq.com/docs/patch>
- Patch Kit Installation Instructions
  - Installing and removing patches using the *dupatch* utility
  - Describes baselining techniques
  - Instructions for rolling and no-roll patching in clusters
  - Provides other information for working with patches
- Patch Summary and Release Notes
  - Provides information about specific patches
  - Summarizes Tru64 UNIX operating system patches included in the kit
  - Summarizes TruCluster patches included in the kit

# Best practices for patches

- Patch “Best Practice” document on-line at [http://www.tru64unix.compaq.com/docs/best\\_practices/](http://www.tru64unix.compaq.com/docs/best_practices/)
  - Not the same as this presentation
- Back up your system first
  - If catastrophe happens while patches are installing, you may have to restore system (or undo rolling upgrade)
  - At a minimum: vdump the /, /usr, and /var filesystems
- Review patch kit release notes
  - Especially if you have CSP’s or ERP’s installed
  - If questions remain about whether a CSP or ERP fix is included in a release patch kit, contact HP support

# Best practices for patches (cont.)

- Check for presence of CSP's / ERP's
  - "Show System Patch History" option from "Patch Tracking" menu
  - (or) *dupatch -track -type kit* command
- Remove CSP's/ERP's installed by dupatch
  - Dupatch doesn't know if fixes are in the release kit, so it won't install the kit on top of them
  - Forthcoming: dupatch will be able to reconcile CSP's with release kits and install kits over CSP's when fixes are included in the release kits (late 2003)



# Best practices for patches (cont.)

- Run “Baseline Analysis/Adjustment” in dupatch
  - Checks for additional missing or inconsistent files that block the installation of specific patches
  - Could be manual (non-dupatch) patches, third-party or freeware utilities, locally modified programs, etc.
  - Selectively enable patch installation if you determine that’s the right course (or don’t enable if it’s not)
- Put a meaningful comment in installation log
  - e.g., “Installing security ERP for CERT advisory XXXX”
  - Dupatch transactions logged in `/var/adm/patch/log`
- Always install patches reversibly
  - Preserve backed-up files in case you need to reverse patches
    - Location selectable; `/var/adm/patch/backup` by default

# Patching clusters

## ■ Rolling Patch

- Allows cluster to remain up while patch operations are performed sequentially on cluster members
- Maintains availability of critical applications
- Can combine aggregate kit + ERP's/CSP's in a single roll
- Can combine installupdate (and/or NHD) + patches in a single roll

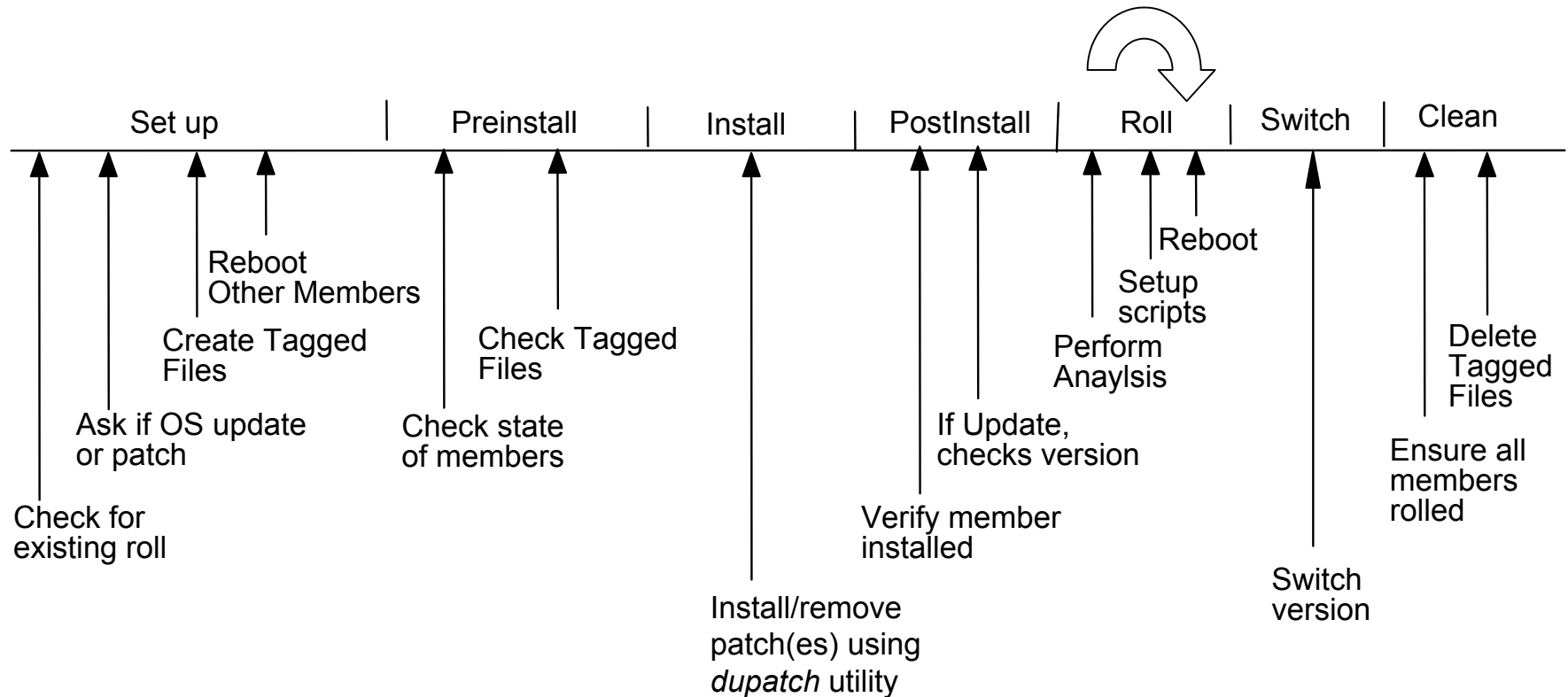
## ■ No-Roll Patch

- Introduced in BL19 patch kits (Spring 2002)
- Allows patches to be managed on the whole cluster at once rather than using rolling patch
- Provides the ability to patch a cluster quickly with minimal downtime

# Version switch technology

- Implemented in V5.1 pk4 and V5.1A IPK (Fall 2001)
- Applicable only in cluster environment
- Prevents the introduction of potentially incompatible new cluster features until all members have been updated with necessary components
- *clu\_upgrade -switch* command activates new version
- Use of the version switch requires a cluster-wide shutdown to remove those patches requiring the version switch
- *clone\_versw\_undo* script for V5.1
- *evm\_versw\_undo* script for V5.1A and V5.1B

# Phases of the rolling upgrade process



# Rolling upgrade: Preparation

- Back up the cluster
- Upgrade firmware if necessary
- Choose a lead member
- *clu\_upgrade -v check\_setup <lead\_member\_id>*

# clu\_upgrade setup

- Verifies:
  - System is part of a cluster configuration
  - No roll is currently in progress
- Asks whether OS upgrade, NHD, or patch (or combo)
- Creates tagged files
  - For best performance, relocate CFS server for /, /usr, /var to the member running this step
- Instructs user to reboot all cluster members except the lead member
  - Non-lead members now running on tagged files
  - Usually done one member at a time to maintain quorum
- Usually takes 45 minutes to 2 hours

# clu\_upgrade preinstall

- Executed on the lead member
- Verifies:
  - Tagged files are present
  - Tagged files match the inventory
  - All non-lead cluster members are running on tagged files
- Usually takes 15 to 30 minutes

# clu\_upgrade install

- Executed on the lead member
- Patches installed/removed using *dupatch* utility
- At this point, only the lead member is running with patches installed (or removed); all other members are running with tagged files and patches uninstalled (or not yet deleted)
- *dupatch* can be run multiple times
  - Can install from multiple patch kits (aggregate and/or ERP and/or CSP)
  - Multiple patch deletions and/or installations can occur within the same roll



# clu\_upgrade postinstall

- Executed on the lead member only
- Checks to see if dupatch has been executed before this step is completed

# clu\_upgrade roll

- All non-lead members must be rolled
- This is an iterative step
  - Repeated on each member until complete
  - Members can be rolled in parallel if cluster quorum is maintained
- Only member-specific files are modified because the shared files are already in place from the roll of the lead member
- Sets up *it(8)* job that will be executed on reboot to perform the roll

## clu\_upgrade roll (cont.)

- Runs in single-user mode on each member
- Backs up member's member-specific files
- Reboots the member and upon reboot:
  - Copies and configures member-specific files from member0
  - Builds new custom kernel for each member
  - Reboots customized kernel
- All cluster members now have patches configured

# clu\_upgrade switch

- Run once after all members have completed their roll
- Any installed patch controlled by a version switch will be enabled on all cluster members
- Prior to this phase, a patch containing a version switch can be deleted
- After this step, the roll itself must be completed; the user is no longer permitted to undo steps

## clu\_upgrade switch (cont.)

- After the version switch has been thrown, removing a patch containing a version switch must follow a special procedure:
  - 1) Complete the roll if still active
  - 2) Run the associated undo script (supplied with the patch subset):
    - *clone\_ver\_sw\_undo* (V5.1)
    - *evm\_ver\_sw\_undo* (V5.1A and up)
    - Allows the patch containing a version switch to be removable
  - 3) Remove the patch

# clu\_upgrade clean

- Verifies that the switch stage has completed
- Removes the tagged files
- Ensures proper cleanup so that future rolls can be performed
- Creates an archive of the logs and status files under */cluster/admin/clu\_upgrade/history*
- Usually takes 30 to 90 minutes
  - As with other steps, run on member that is CFS serving /, /usr, and /var filesystems (or relocate them)

# No-roll patch process

- Introduced in BL19 (V5.1A PK2/V5.1 PK5) as an alternative to the rolling patch process
  - Some users considered the cluster to be unavailable while in the midst of a roll
  - User may be applying only a single patch (ERP or CSP) and doesn't need or want to use the lengthy roll process
- Provides the user with a procedure to maintain patches with minimal downtime and less manual intervention
- Applies patches to all members automatically

## No-roll patch process (cont.)

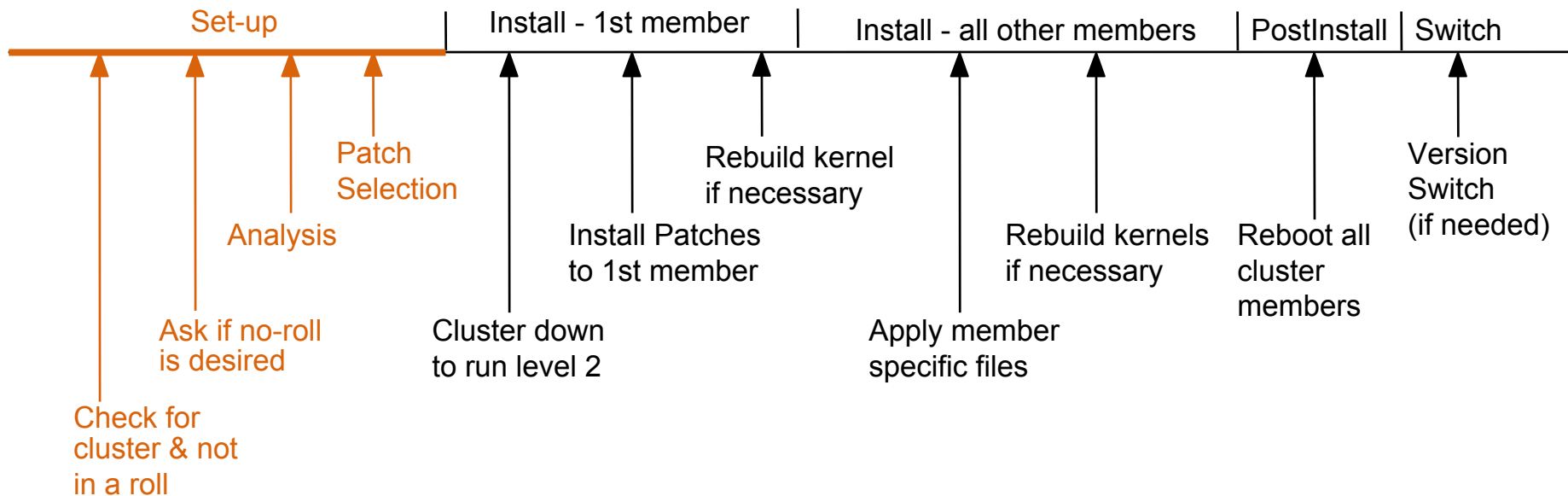
- Requires less disk space than rolling patch process (no tagged files)
- Cluster services are not available during this process
- Cluster restarted after all members have been patched



# No-roll patch – Preconditions

- Quorum configuration is important
  - Quorum must be configured such that all cluster members can go down (serially or in tandem) while maintaining quorum
  - Detailed information provided in the *Cluster Installation Guide*
- Cluster members must be in multi-user mode because EVM is used to generate cluster-wide events

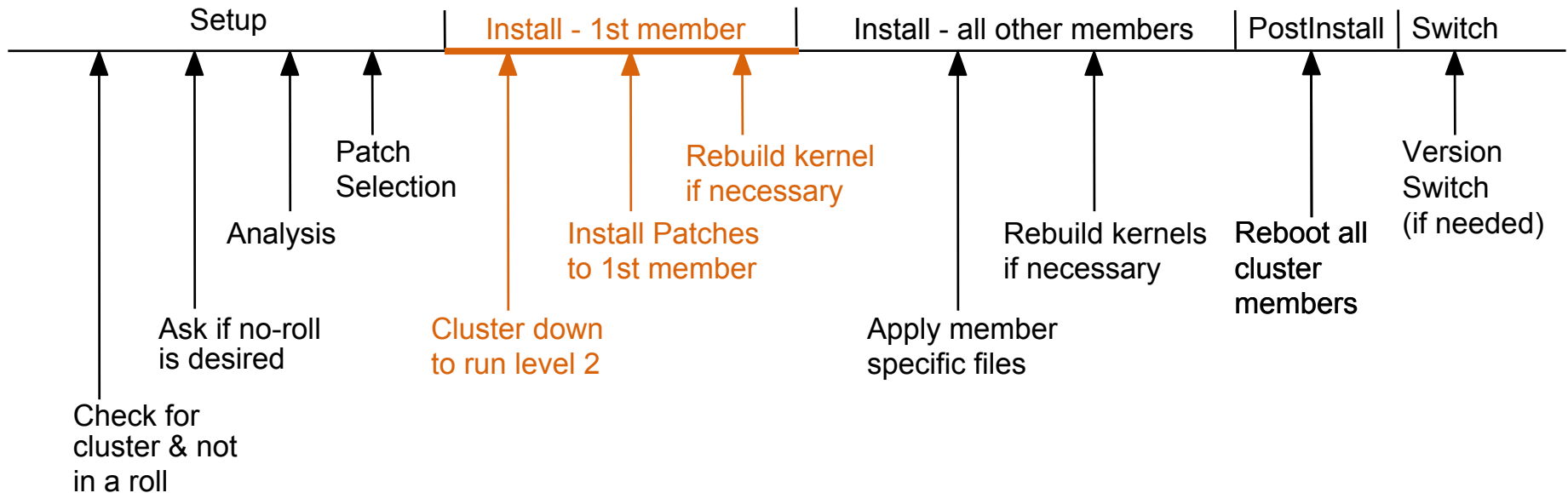
# No-roll patch timeline



# No-roll patch - Set-up

- In *dupatch*, user selects install/delete patches
- Checks for correct state:
  - Configuration is a cluster
  - A cluster roll is not in progress
- Confirms that a no-roll operation is desired
- Verifies that cluster is in multi-user mode
- Performs analysis
  - Disk space
  - Dependencies
- User selects the list of patches to be installed
- Remainder of the no-roll process is automated

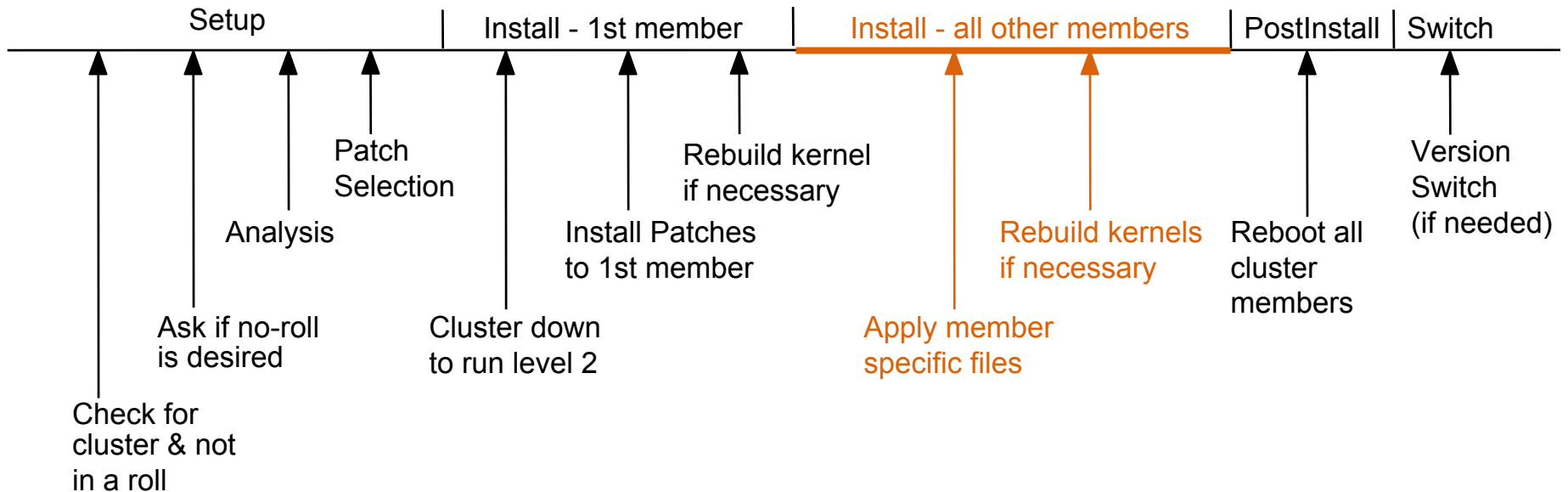
# No-roll patch timeline



# No-roll patch - Install first member

- “First member” is the cluster member running dupatch
- Cluster is brought down to run level 2 via a cluster-wide event
- Patches are loaded and configured on the first cluster member
- If any patches require a kernel build, a new kernel is built automatically

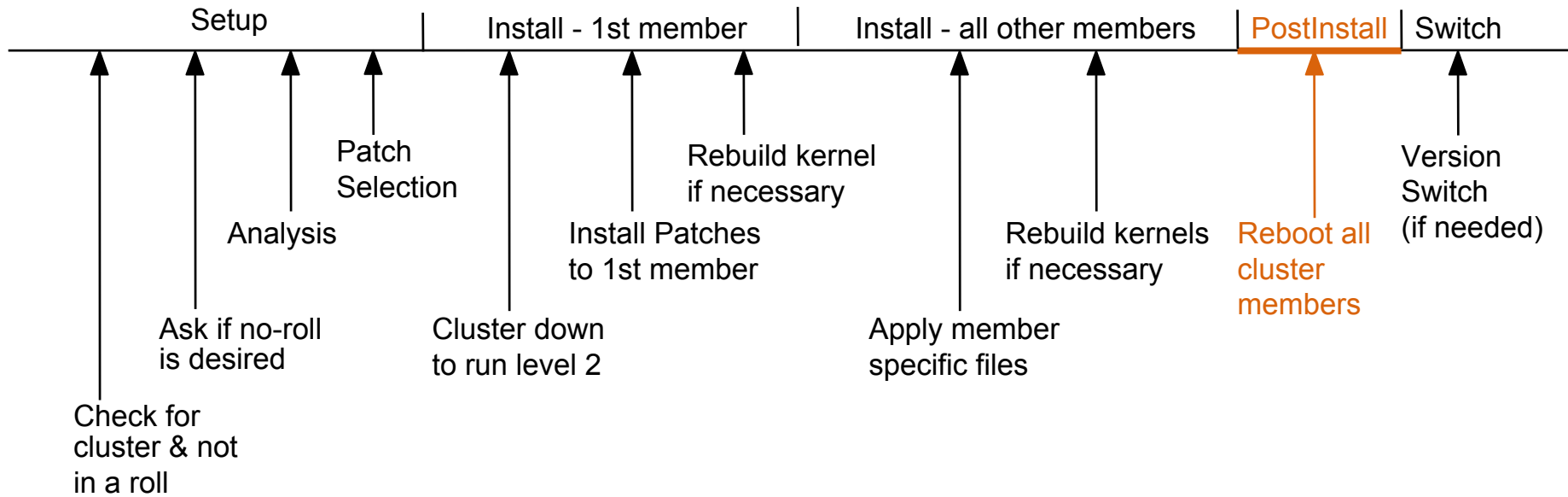
# No-roll patch timeline



# No-roll patch - Install all members

- A second cluster-wide event is issued on all running cluster members:
  - Executes */var/adm/patch/patch\_member\_noroll* script
  - Operation is done in parallel to minimize downtime
- For a down member:
  - Posts an *it(8)* job which, upon reboot, will run */var/adm/patch/patch\_member\_noroll*
  - Populates member-specific files and automatically rebuilds kernel, if necessary

# No-roll patch timeline

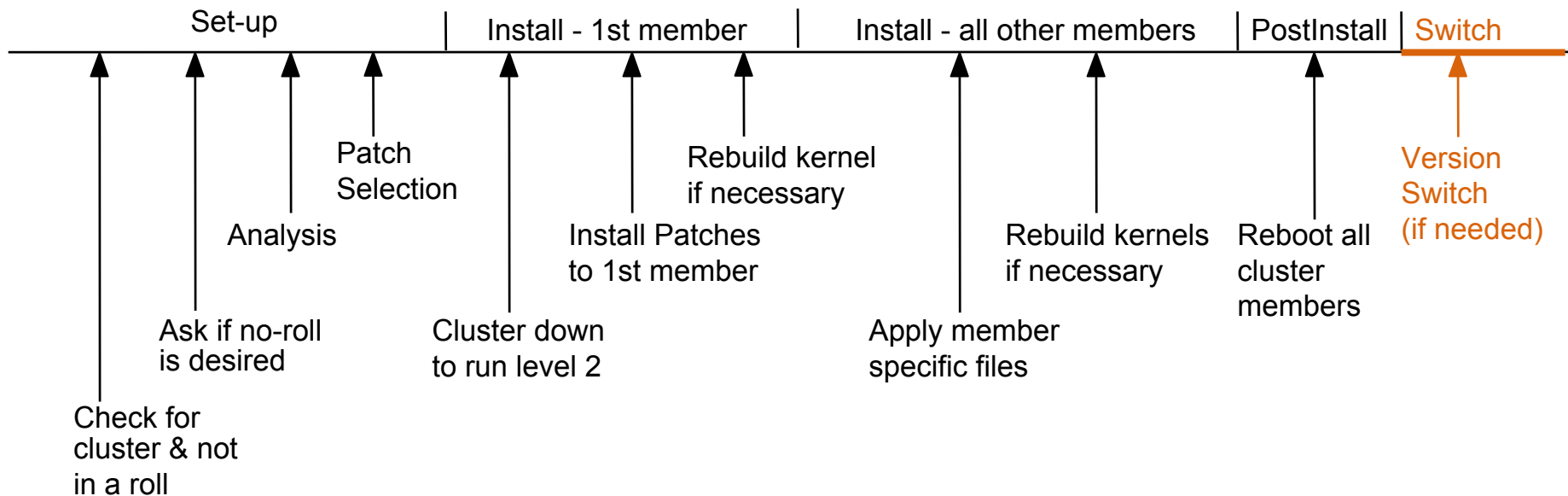




# No-roll patch - Postinstall

- Status of all members is checked
- Cluster-wide event is issued that causes all members in the cluster to be rebooted
- Cluster members will reboot in a fashion that will not lose cluster quorum during the reboot

# No-roll patch timeline



# No-roll patch - Switch

- If a patch containing a version switch has been installed, the user must manually throw the version switch for the cluster as a whole by running the script */var/adm/patch/noroll/noroll\_versw*
- All cluster members must be up at this time
- Once the switch has been thrown, if the version switch patch needs to be removed, the undo script must be run followed by patch deletion (identical to rolling patch process)
- It is recommended that the cluster be rebooted after throwing the switch

# Handling errors in no-roll patch

- At the start of a no-roll operation, *dupatch* determines which members are presently up
  - Members that were known to be running at the start of the no-roll operation, but do not respond to later cluster events, will cause the no-roll operation to be suspended until the problem has been corrected by the user
- Status from the script is reported in a file in the shared directory */var/adm/patch/noroll\_results*

# Rolling vs. no-roll comparison

	Rolling Patch	No-Roll Patch
Cluster Services	Available	Unavailable
Time to Complete	Lengthy	Minimal
Reboots per Member	4	1
Additional Disk Space Needed	Yes (for tagged files)	No
Automated Process	No	Yes
Combine Patch with OS Upgrade	Yes	No
Removal of version-switch patch	Manual	Manual

# Upgrading Tru64 UNIX

- *installupdate* utility does the following:
  - Checks for file type conflicts
  - Checks for sufficient disk space
    - Provides several options to free up space
  - Notifies of possibly conflicting layered products
  - Optionally removes blocking layered products
  - Updates base OS, TCR, and WLS subsets to new version

# Tru64 UNIX upgrade paths (standalone systems)

To get to this version:	You can do one update from:
V4.0D	V4.0A, V4.0B, V4.0C
V4.0E	V4.0B, V4.0C, V4.0D
V4.0F	V4.0D, V4.0E
V4.0G	V4.0D, V4.0E, V4.0F
V5.0	V4.0D, V4.0F
V5.0A	V4.0F, V5.0
V5.1	V4.0G, V5.0A
V5.1A	V5.0A, V5.1
V5.1B	V5.1, V5.1A

# TruCluster upgrade paths

- A rolling upgrade can only be performed to the next higher version of TCR software
  - V1.4A to V1.5
  - V1.5 to V1.6
  - V5.0A to V5.1
  - V5.1 to V5.1A
  - V5.1A to V5.1B
- No rolling upgrade path from TCR 1.6 to TCR version 5 due to introduction of Single System Image
- So clusters must roll in small steps
  - V5.1 cluster must roll to V5.1A before rolling to V5.1B
  - Standalone V5.1 system could go to V5.1B in one step



# Best practices for upgrades

- Back up your system first
  - If catastrophe happens while subsets are loading, you'll probably have to restore system (or undo rolling upgrade)
  - At a minimum: vdump the /, /usr, and /var filesystems
- Check release notes and installation guide
  - Is platform still supported? (Very old ones may not be)
- Upgrade firmware if needed
  - After upgrade, re-run ECU on systems with EISA buses
- Verify AdvFS domains
- Run *cdslinvchk* to verify CDSL integrity
- No need to install patches on old version prior to upgrade (but do install them on the new version)

# Things to consider

- How many upgrades to do vs. a full install?
  - Time/risk tradeoff vs. effort to recustomize system
- 4.0F to 5.0A upgrade is problematical
  - Avoid if possible by choosing a different path: e.g., 4.0F to 4.0G to 5.1 to 5.1B instead of 4.0F to 5.0A to 5.1A to 5.1B
- If root directory is mirrored via LSM, consider unencapsulating it during upgrade
  - One less layer of complexity
  - Former mirror plex is a snapshot of pre-upgrade root

# New Hardware Delivery (NHD)

- Periodic kits issued to provide Tru64 UNIX support for new hardware options
  - Six kits issued to date; more to come
  - Provides support for V5.1A and V5.1B
- NHD-6 added support for Broadcom 5703 GbE NIC, SmartArray RAID controller, DS20L, and additional 5.1B functionality for EV7 systems (ES47, ES80, GS1280)
- Where to get NHD kits?
  - Factory installed on new systems
  - CD-ROM bundled with Tru64 UNIX media kit or available separately (part number QA-MT4AX-H8)
  - <http://ftp.support.compaq.com/public/unix/v5.1a/nhd/> (or “v5.1b” instead of “v5.1a”)



# HP WORLD 2003

Solutions and Technology Conference & Expo

Interex, Encompass and HP bring you a powerful new HP World.

