Development for Linux PC Farms at DESY Zeuthen

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Introduction

- The different groups at DESY Zeuthen wanted to increase their compute power (End of '97)
- Price/performance ratio was (and still is) best for PCs
- On the software side: UNIX is the common operating system
- Linux is a Unix clone and it is free software
- For DESY (HH & Zeuthen) Linux was a 'new' platform
- From the beginning we made two major decisions:
  - Integrate Linux in the existing Unix environment (no special solutions for Linux)
  - We wanted to have some automatic installation for Linux, because we wanted to set up large clusters of equal PCs with little manpower (Auto–Installation)

The Software

- We (Hamburg and Zeuthen) decided to choose SuSE–Linux:
  - SuSE is a german distributor
  - We had already some experience with it
  - SuSE made some automated installation for us:
    They modified their installation tool (YaST) in a way, that the installation can be done with a boot disk over the net from a server without a keystroke (Basic–Installation)
- Because we wanted to integrate Linux in our Unix environment we adapted our Unix Post–Installation for Linux (different in HH & Zeuthen)
- This also means that the user finds her/his usual environment (No extra home directory, no extra 'farm'– users, same data disks, . . .) on Linux
- One new feature (for Zeuthen) is that the user home directories on Linux are in AFS, we want to migrate to AFS home directories on all Unix platforms in the next year(s)

The Auto–Installation:
Basic–Installation (SuSE Linux)

- The whole installation of a Linux PC is done automatically
- Inserting a (modified) bootdisk starts installation (YaST)
- Configuration can be done on the boot disk or on the server:
  - Partition table on server (depends on hard disk size):
    - size of SWAP partition
    - (how many SWAP partitions)
    - size of afs-cache
  - Kernel selection: SCSI or EIDE, SMP
  - Hostname, ip–address, network(routing) via bootp, configured by SuSE–script:
    /etc/HOSTNAME, /etc/route.conf, /etc/resolv.conf, /etc/hosts, . . .

- Package selection (from distribution):
  $\approx$ 220 packages $\rightarrow$ 320 MB system disk space

- Additional (selfmade) packages to install:
  - postinstall $\rightarrow$ root password, modules, ...
  - AFS–client $\rightarrow$ “mini–AFS” (module & demon) to have AFS file system available for Post–Installation
  - SUE–bootstrap $\rightarrow$ to start Zeuthen Post–Installation
- Basic–Installation sets up a ‘distributor–like’ Linux
- After Basic–Installation $\rightarrow$ (soft) reboot $\rightarrow$ Post–Installation starts

The Auto–Installation:
Post–Installation (Zeuthen specific environment)

- We use now SUE (CERN) & CFENGINE (Oslo College) for setting up the Zeuthen specific environment and for updating and maintaining the system
- The Post–Installation is platform independent, we use SUE & CFENGINE on all our platforms
- The Post–Installation is started automatically after Basic–Installation
- On Linux $\approx$ 40 features are set up, e.g.:
  - afs–client $\rightarrow$ complete the ‘mini’ AFS client
  - yp–client/server $\rightarrow$ setting up NIS
  - amd/autofs $\rightarrow$ the data disks within the farm and from the file servers are accessable through the automounter
  - kerberos/login/passwd/trusted $\rightarrow$ handle access/login
  - ssh $\rightarrow$ SSH is our ‘backbone’ for remote access

- tcp–wrapper, inetd → configure and control network services
- printing → sets up printing, all DESY printers (Zeuthen & Hamburg) are available
- profiles → sets up shell environment, prompt, helpful abbreviations (`ff`, `ll`, `pp`)
- patrol → sets up PATROL
- codine → CODINE (our batch system), is set up on demand
- and lots more ...

- After Post–Installation is done, the PC is ready (Remove boot disk and reboot)
- All Post–Installation scripts are written in a way that they can be executed as many times as you want
- The installation is controlled by a "database", that is at the moment a plain ASCII–file
- Post–Installation sets up a 'Zeuthen–like' Linux(Unix)

The hardware setup of the farm PCs

- DESY has a ‘standard PC’, but things change (often;)
- ASUS Motherboard
- 2–4 GB SCSI system disk + additional data disk(s)
- Fast Ethernet 100 MBit network card
- Floppy drive for installation
- Cheap graphic card (no console is connected to the PC)
- Console manager over serial port
- Located in racks in the Computer Center

The development (Fall 97 – now)

The beginning (Fall 97 – spring 98):

- Build up the automatic installation
- First farm: Husky Farm (March 1998)
- Experiment AMANDA (Neutrino South Pole Exp.)
- 20 266MH Pentium II
- Set up with SuSE Linux 5.0, Kernel 2.0.30
- PostInstallation with CFENGINE (NFS)
- Own Subnet (141.34.15.)
- In the beginning only 10MBit Ethernet
- Poor connections to Unix file server

The next farms (spring 98):

- The next: Elan Farm (H1) & Beauty Farm (HERA-B)
- Elan Farm: 8 333MHz Pentium II
- Beauty Farm: 5 333MHz Pentium II
- Setup in April 1998
- Same software installation as Husky Farm

During summer 98:

- Linux installation adapted to Linux Desktop PCs
- Upgrade SuSE 5.0 → 5.2
- Postinstallation rewritten:
  - Now SUE(CERN) + CFENGINE
  - Repository in AFS
  - Some few features devided in smaller one

Fall 98:

- Elan Farm upgrade:
  - 2 new DUALS 400MHz Pentium II
  - 3rd SCSI Disk 18 GB for all nodes
- Husky Farm upgrade:
  - first 6 nodes upgraded to 400MHz/256 MB memory
- Software Linux 5.3
- All PCs with Kernel 2.0.36
- Network reorganization, new HUB
- New file server for Linux (SUN workstation)
- Exp. ZEUS has first Linux PC (replacement for SGI)

Beginning of 99:

- Beginning of 99:
- 2 DUALS 450 Pentium II as WGS for Linux
- Start investigation of SuSE Linux 6.x (now 6.1)
- libc5 → glibc (libc6)
- Improvement of AutoInstallation tool (YaST) (together with HH)
- Now test machines setup with SuSE 6.1
  (Kernel 2.2.3 (AFS)) for the experiments to test their software

Outlook

- One new farm is planned:
  - L3 (CERN experiment) wants 12 CPUs (6 duals) in summer
- Upgrade of existing farms:
  - Elan farm needs more CPUs
  - Husky farm CPU upgrade continues
  - All farms are upgraded to SuSE 6.x
- more WGS will be installed for common login
- The trend (in HEP and at DESY) is: replace old UNIX Flavours (AIX, HP, SGI, ...) with Linux (If possible)
- → We will have more Linux farms