4. Startup und Shutdown

UNIX-Systeme müssen immer definiert angehalten werden:

shutdown, init 0, halt, poweroff, reboot !!!

Mittels "booten" werden UNIX-Systeme in einen definierten Arbeits-zustand gebracht:

- **single-user**
- **multi-user ohne Netzwerk**
- **multi-user mit Netzwerk**
- **multi-user mit Netzwerk und XDM**

Booten eines UNIX-Systems(Kurzfassung):

Hardware/Softwarevoraussetzungen:

- **BIOS, EPROM, EEPROM, NVRAM, ROM mit Bootmonitor**
  - **SUN, DEC, PC**
- **EPROM, ROM mit festem Bootprogram**
  - **IBM/RS6000, HP**

Bootmanager, Bootprogramm auf Datenträger:

- **LINUX: LILO, GRUP**
- **IBM/RS6000: spezielle Datenträger, auswahl mittels einschalten**
- **HP: spezielle Datenträger, flinke Finger, warten**
- **SUN: Serviceprozessor**

Bootvorgang:

- laden eines intelligenten Ladeprogramms vom Bootmedium (ufsboot, inetboot, osf_boot, boot.b (Hardware-boot)
- laden des Kernels vom Bootmedium (OS Loader)
  /vmunix (SunOS, True64), /stand/vmunix (HP-UX),
  /kernel/kmbd/sparcv9/genunix (SOLARIS),
  /unix - /usr/lib/boot (AIX), /boot/vmlinuz... (Linux)

- Kernelinitialisierung (Kernel Startup)
  Hardwaretest, Geräteerkennung, laden der Firmware, laden und initialisieren der Driver, Aufbau der internen Tabellen

- Kernelfork und starten des init-Programms (init, inittab)

- Abarbeiten von Scripten (Hier kann der Sysadmin mitwirken) (Boot Scripts)
  - Prüfung der Filesystemintegrität (fsck, ...)
  - Mounten von lokalen Platten (root-Filesystem ist immer das erste)
    mount -o rw,remount / # ro-Filesystem --> rw-Filesystem
  - Crashdump sichern
  - Swap-Space zuordnen
  - Sicherheits-Checks (passwd, ...)
  - Cleaning der Filesysteme (/tmp, /usr/spool/lock, ...)
  - Starten der lokalen Serverprozesse
  - Starten des Netzwerkes
  - Starten der Netzwerkdämonen
  - Nutzer freigeben

  dauert am längsten - Parallelisierung angestrebt

```
NVRAM-Einstellungen:
     Möglich bei: PC, SUN, DEC3000, DEC1000
     Was?: Bootdevice (lokaler Datenträger, Netz)
           Passwort
           Hardware
           Umgebungsvariable
           Bootparameter

Hardware-Einstellungen:
     IBM/RS6000:  Schlüssel

Booten in Single-User:
     Bootmonitor/Bootmanager:
         z.B.:
                Solaris:  ok boot -s

                linux:    boot: linux single          (LILO)
                          grub> root (hd0,0)          (GRUB)
                          grub> kernel /vmlinuz ro root=/dev/hda2 single
                          grub> initrd /initrd.img
                          grub> boot

                HP-UX:    nach Einschalten Taste drücken
                          > bo P1
                          Interact with ISL? y
                          ISL> hpux -is

                True64:   >>> boot -fl s
```

```
        Achtung: Single-User mit Passwort absichern!!
           AIX:     automatisch
           HP-UX:   automatisch
           Solaris: erforderlich
           Linux:   erforderlich
                    auch /boot/grub/menu.lst absichern
     Hardware:
        Stellung des Schlüssels

Booten in Multi-User:
     Standard oder Single-User mit ^D beenden
      z.B.
         Solaris:    > boot
                     > boot cdrom
                     > boot disk
                     > boot -r

Mögliche Systemzustände:
              Single-User
              Sysadmin-Zustand
              Multi-User ohne Netzwerk
              Multi-User mit Netzwerk
              X-Workstation
              Reboot
              Powerdown
              Powerfail
              Systemdiagnose
```

```
 Erfragen des Aktuellen Systemzustandes:
       who -r  (Solaris)
       runlevel (Linux)

 Wechsel der Systemzustände:
       init  <Nummer des Zielzustandes>

Linux mit Kommando dmesg:

Linux version 2.6.11.4-20a-default (geeko@buildhost) (gcc version 3.3.5 20050
BIOS-provided physical RAM map:
 BIOS-e820: 0000000000000000 - 000000000009f000 (usable)
 BIOS-e820: 000000000009f000 - 00000000000a0000 (reserved)
 BIOS-e820: 00000000000d2000 - 00000000000d4000 (reserved)
 BIOS-e820: 00000000000dc000 - 0000000000100000 (reserved)
 BIOS-e820: 0000000000100000 - 000000003ff60000 (usable)
 BIOS-e820: 000000003ff60000 - 000000003ff77000 (ACPI data)
 BIOS-e820: 000000003ff77000 - 000000003ff79000 (ACPI NVS)
 BIOS-e820: 000000003ff80000 - 0000000040000000 (reserved)
 BIOS-e820: 00000000ff800000 - 0000000100000000 (reserved)
127MB HIGHMEM available.
896MB LOWMEM available.
On node 0 totalpages: 261984
  DMA zone: 4096 pages, LIFO batch:1
  Normal zone: 225280 pages, LIFO batch:16
  HighMem zone: 32608 pages, LIFO batch:7
DMI present.
Allocating PCI resources starting at 40000000 (gap: 40000000:bf800000)
Built 1 zonelists
Kernel command line: root=/dev/hda7 vga=0x314 selinux=0 splash=silent resume=
```

```
bootsplash: silent mode.
Initializing CPU#0
PID hash table entries: 4096 (order: 12, 65536 bytes)
Detected 1694.804 MHz processor.
Using tsc for high-res timesource
Console: colour dummy device 80x25
Dentry cache hash table entries: 131072 (order: 7, 524288 bytes)
Inode-cache hash table entries: 65536 (order: 6, 262144 bytes)
Memory: 1033760k/1047936k available (1865k kernel code, 13472k reserved, 659k
Checking if this processor honours the WP bit even in supervisor mode... Ok.
Calibrating delay loop... 3350.52 BogoMIPS (lpj=1675264)
Security Framework v1.0.0 initialized
SELinux:  Disabled at boot.
Mount-cache hash table entries: 512 (order: 0, 4096 bytes)
CPU: After generic identify, caps: a7e9f9bf 00000000 00000000 00000000 000001
CPU: After vendor identify, caps: a7e9f9bf 00000000 00000000 00000000 0000018
CPU: L1 I cache: 32K, L1 D cache: 32K
CPU: L2 cache: 1024K
CPU: After all inits, caps: a7e9f9bf 00000000 00000000 00000040 00000180 0000
Intel machine check architecture supported.
Intel machine check reporting enabled on CPU#0.
CPU: Intel(R) Pentium(R) M processor 1700MHz stepping 05
Enabling fast FPU save and restore... done.
Enabling unmasked SIMD FPU exception support... done.
Checking 'hlt' instruction... OK.
checking if image is initramfs... it is
Freeing initrd memory: 1305k freed
NET: Registered protocol family 16
PCI: PCI BIOS revision 2.10 entry at 0xfd8d6, last bus=8
PCI: Using configuration type 1
```

```
mtrr: v2.0 (20020519)
ACPI: Subsystem revision 20050211
ACPI: Interpreter disabled.
Linux Plug and Play Support v0.97 (c) Adam Belay
pnp: PnP ACPI: disabled
PCI: Probing PCI hardware
PCI: Probing PCI hardware (bus 00)
PCI: Ignoring BAR0-3 of IDE controller 0000:00:1f.1
PCI: Transparent bridge - 0000:00:1e.0
PCI: Discovered primary peer bus 09 [IRQ]
PCI: Using IRQ router PIIX/ICH [8086/24cc] at 0000:00:1f.0
PCI: IRQ 0 for device 0000:00:1f.1 doesn't match PIRQ mask - try pci=usepirqm
PCI: Found IRQ 11 for device 0000:00:1f.1
PCI: Sharing IRQ 11 with 0000:00:1d.2
PCI: Sharing IRQ 11 with 0000:02:00.2
PCI: Sharing IRQ 11 with 0000:02:02.0
TC classifier action (bugs to netdev@oss.sgi.com cc hadi@cyberus.ca)
IBM machine detected. Enabling interrupts during APM calls.
apm: BIOS version 1.2 Flags 0x03 (Driver version 1.16ac)
audit: initializing netlink socket (disabled)
audit(1114677152.379:0): initialized
highmem bounce pool size: 64 pages
Total HugeTLB memory allocated, 0
VFS: Disk quotas dquot_6.5.1
Dquot-cache hash table entries: 1024 (order 0, 4096 bytes)
Initializing Cryptographic API
vesafb: framebuffer at 0xe0000000, mapped to 0xf8880000, using 3750k, total 3
vesafb: mode is 800x600x16, linelength=1600, pages=33
vesafb: protected mode interface info at c000:580d
vesafb: scrolling: redraw
```

```
vesafb: Truecolor: size=0:5:6:5, shift=0:11:5:0
bootsplash 3.1.6-2004/03/31: looking for picture...<6> silentjpeg size 39926
Console: switching to colour frame buffer device 99x34
fb0: VESA VGA frame buffer device
isapnp: Scanning for PnP cards...
isapnp: No Plug & Play device found
Real Time Clock Driver v1.12
PNP: No PS/2 controller found. Probing ports directly.
serio: i8042 AUX port at 0x60,0x64 irq 12
serio: i8042 KBD port at 0x60,0x64 irq 1
Serial: 8250/16550 driver $Revision: 1.90 $ 48 ports, IRQ sharing enabled
PCI: Found IRQ 11 for device 0000:00:1f.6
PCI: Sharing IRQ 11 with 0000:00:1f.3
PCI: Sharing IRQ 11 with 0000:00:1f.5
io scheduler noop registered
io scheduler anticipatory registered
io scheduler deadline registered
io scheduler cfq registered
Floppy drive(s): fd0 is 1.44M
FDC 0 is a National Semiconductor PC87306
RAMDISK driver initialized: 16 RAM disks of 64000K size 1024 blocksize
loop: loaded (max 8 devices)
mice: PS/2 mouse device common for all mice
input: PC Speaker
md: md driver 0.90.1 MAX_MD_DEVS=256, MD_SB_DISKS=27
NET: Registered protocol family 2
IP: routing cache hash table of 8192 buckets, 64Kbytes
TCP established hash table entries: 262144 (order: 9, 2097152 bytes)
TCP bind hash table entries: 65536 (order: 6, 262144 bytes)
TCP: Hash tables configured (established 262144 bind 65536)
```

```
NET: Registered protocol family 1
PM: Checking swsusp image.
PM: Resume from disk failed.
input: AT Translated Set 2 keyboard on isa0060/serio0
Freeing unused kernel memory: 204k freed
Uniform Multi-Platform E-IDE driver Revision: 7.00alpha2
ide: Assuming 33MHz system bus speed for PIO modes; override with idebus=xx
ICH4: IDE controller at PCI slot 0000:00:1f.1
PCI: Enabling device 0000:00:1f.1 (0005 -> 0007)
PCI: Found IRQ 11 for device 0000:00:1f.1
PCI: Sharing IRQ 11 with 0000:00:1d.2
PCI: Sharing IRQ 11 with 0000:02:00.2
PCI: Sharing IRQ 11 with 0000:02:02.0
ICH4: chipset revision 1
ICH4: not 100% native mode: will probe irqs later
    ide0: BM-DMA at 0x1860-0x1867, BIOS settings: hda:DMA, hdb:pio
    ide1: BM-DMA at 0x1868-0x186f, BIOS settings: hdc:DMA, hdd:pio
Probing IDE interface ide0...
hda: IC25N080ATMR04-0, ATA DISK drive
ide0 at 0x1f0-0x1f7,0x3f6 on irq 14
Probing IDE interface ide1...
hdc: MATSHITADVD-RAM UJ-811, ATAPI CD/DVD-ROM drive
ide1 at 0x170-0x177,0x376 on irq 15
hda: max request size: 128KiB
Synaptics Touchpad, model: 1
 Firmware: 5.9
 Sensor: 44
 new absolute packet format
 Touchpad has extended capability bits
 -> multifinger detection
```

```
 -> palm detection
 -> pass-through port
serio: Synaptics pass-through port at isa0060/serio1/input0
input: SynPS/2 Synaptics TouchPad on isa0060/serio1
hda: 156301488 sectors (80026 MB) w/7884KiB Cache, CHS=65535/16/63, UDMA(100)
hda: cache flushes supported
 hda: hda1 hda2 hda3 < hda5 hda6 hda7 >
hdc: ATAPI 24X DVD-ROM DVD-R-RAM CD-R/RW drive, 2048kB Cache, UDMA(33)
Uniform CD-ROM driver Revision: 3.20
Attempting manual resume
PM: Checking swsusp image.
swsusp: Suspend partition has wrong signature?
PM: Resume from disk failed.
input: PS/2 Generic Mouse on synaptics-pt/serio0
ReiserFS: hda7: found reiserfs format "3.6" with standard journal
ReiserFS: hda7: using ordered data mode
reiserfs: using flush barriers
ReiserFS: hda7: journal params: device hda7, size 8192, journal first block 1
ReiserFS: hda7: checking transaction log (hda7)
ReiserFS: hda7: Using r5 hash to sort names
bootsplash: status on console 0 changed to on
md: Autodetecting RAID arrays.
md: autorun ...
md: ... autorun DONE.
Adding 536720k swap on /dev/hda6.  Priority:42 extents:1
device-mapper: 4.4.0-ioctl (2005-01-12) initialised: dm-devel@redhat.com
SCSI subsystem initialized
NTFS driver 2.1.22 [Flags: R/W MODULE].
NTFS volume version 3.1.
FAT: utf8 is not a recommended IO charset for FAT filesystems, filesystem wil
```

```
NET: Registered protocol family 10
Disabled Privacy Extensions on device c033d600(lo)
IPv6 over IPv4 tunneling driver
ip6_tables: (C) 2000-2002 Netfilter core team
ip_tables: (C) 2000-2002 Netfilter core team
ip_conntrack version 2.1 (8187 buckets, 65496 max) - 248 bytes per conntrack
Disabled Privacy Extensions on device f7afe400(sit0)
parport0: PC-style at 0x3bc [PCSPP,TRISTATE]
lp0: using parport0 (polling).
bootsplash: status on console 0 changed to on
hw_random hardware driver 1.0.0 loaded
Linux agpgart interface v0.100 (c) Dave Jones
agpgart: Detected an Intel 855PM Chipset.
agpgart: Maximum main memory to use for agp memory: 941M
agpgart: AGP aperture is 256M @ 0xd0000000
usbcore: registered new driver usbfs
usbcore: registered new driver hub
load_module: err 0xffffffef (dont worry)
USB Universal Host Controller Interface driver v2.2
PCI: Found IRQ 11 for device 0000:00:1d.0
PCI: Sharing IRQ 11 with 0000:01:00.0
PCI: Sharing IRQ 11 with 0000:02:00.0
PCI: Sharing IRQ 11 with 0000:02:01.0
uhci_hcd 0000:00:1d.0: UHCI Host Controller
Linux Kernel Card Services
  options:  [pci] [cardbus] [pm]
load_module: err 0xffffffef (dont worry)
PCI: Setting latency timer of device 0000:00:1d.0 to 64
uhci_hcd 0000:00:1d.0: irq 11, io base 0x1800
uhci_hcd 0000:00:1d.0: new USB bus registered, assigned bus number 1
```

```
hub 1-0:1.0: USB hub found
hub 1-0:1.0: 2 ports detected
PCI: Found IRQ 11 for device 0000:00:1d.1
uhci_hcd 0000:00:1d.1: UHCI Host Controller
PCI: Setting latency timer of device 0000:00:1d.1 to 64
uhci_hcd 0000:00:1d.1: irq 11, io base 0x1820
uhci_hcd 0000:00:1d.1: new USB bus registered, assigned bus number 2
hub 2-0:1.0: USB hub found
hub 2-0:1.0: 2 ports detected
PCI: Found IRQ 11 for device 0000:00:1d.2
PCI: Sharing IRQ 11 with 0000:00:1f.1
PCI: Sharing IRQ 11 with 0000:02:00.2
PCI: Sharing IRQ 11 with 0000:02:02.0
uhci_hcd 0000:00:1d.2: UHCI Host Controller
load_module: err 0xffffffef (dont worry)
PCI: Setting latency timer of device 0000:00:1d.2 to 64
uhci_hcd 0000:00:1d.2: irq 11, io base 0x1840
uhci_hcd 0000:00:1d.2: new USB bus registered, assigned bus number 3
hub 3-0:1.0: USB hub found
hub 3-0:1.0: 2 ports detected
PCI: Found IRQ 11 for device 0000:00:1d.7
ehci_hcd 0000:00:1d.7: EHCI Host Controller
PCI: Setting latency timer of device 0000:00:1d.7 to 64
ehci_hcd 0000:00:1d.7: irq 11, pci mem 0xc0000000
ehci_hcd 0000:00:1d.7: new USB bus registered, assigned bus number 4
PCI: cache line size of 32 is not supported by device 0000:00:1d.7
ehci_hcd 0000:00:1d.7: USB 2.0 initialized, EHCI 1.00, driver 10 Dec 2004
hub 4-0:1.0: USB hub found
hub 4-0:1.0: 6 ports detected
load_module: err 0xffffffef (dont worry)
```

```
load_module: err 0xffffffef (dont worry)
PCI: Found IRQ 11 for device 0000:00:1f.5
PCI: Sharing IRQ 11 with 0000:00:1f.3
PCI: Sharing IRQ 11 with 0000:00:1f.6
PCI: Setting latency timer of device 0000:00:1f.5 to 64
Intel(R) PRO/1000 Network Driver - version 5.6.10.1-k2-NAPI
Copyright (c) 1999-2004 Intel Corporation.
ieee1394: Initialized config rom entry 'ip1394'
ieee80211_crypt: unsupported module, tainting kernel.
ieee80211_crypt: registered algorithm 'NULL'
ieee80211: unsupported module, tainting kernel.
ipw2200: unsupported module, tainting kernel.
ipw2200: Intel(R) PRO/Wireless 2200/2915 Network Driver, 1.0.3
ipw2200: Copyright(c) 2003-2004 Intel Corporation
usb 2-1: new low speed USB device using uhci_hcd and address 2
intel8x0_measure_ac97_clock: measured 49344 usecs
intel8x0: clocking to 48000
PCI: Found IRQ 11 for device 0000:02:00.0
PCI: Sharing IRQ 11 with 0000:00:1d.0
PCI: Sharing IRQ 11 with 0000:01:00.0
PCI: Sharing IRQ 11 with 0000:02:01.0
Yenta: CardBus bridge found at 0000:02:00.0 [1014:0552]
Yenta: Using INTVAL to route CSC interrupts to PCI
Yenta: Routing CardBus interrupts to PCI
Yenta TI: socket 0000:02:00.0, mfunc 0x01d21b22, devctl 0x64
Yenta: ISA IRQ mask 0x06b8, PCI irq 11
Socket status: 30000086
load_module: err 0xffffffef (dont worry)
PCI: Found IRQ 11 for device 0000:02:01.0
PCI: Sharing IRQ 11 with 0000:00:1d.0
```

```
PCI: Sharing IRQ 11 with 0000:01:00.0
PCI: Sharing IRQ 11 with 0000:02:00.0
e1000: eth0: e1000_probe: Intel(R) PRO/1000 Network Connection
ohci1394: $Rev: 1250 $ Ben Collins <bcollins@debian.org>
PCI: Found IRQ 11 for device 0000:02:00.2
PCI: Sharing IRQ 11 with 0000:00:1d.2
PCI: Sharing IRQ 11 with 0000:00:1f.1
PCI: Sharing IRQ 11 with 0000:02:02.0
ohci1394: fw-host0: OHCI-1394 1.1 (PCI): IRQ=[11]  MMIO=[c0215000-c02157ff]
PCI: Found IRQ 11 for device 0000:02:02.0
PCI: Sharing IRQ 11 with 0000:00:1d.2
PCI: Sharing IRQ 11 with 0000:00:1f.1
PCI: Sharing IRQ 11 with 0000:02:00.2
ipw2200: Detected Intel PRO/Wireless 2200BG Network Connection
ieee1394: Host added: ID:BUS[0-00:1023]  GUID[000ae4aaaa2562e8]
st: Version 20041025, fixed bufsize 32768, s/g segs 256
BIOS EDD facility v0.16 2004-Jun-25, 1 devices found
cs: IO port probe 0xc00-0xcff: clean.
cs: IO port probe 0x820-0x8ff: clean.
cs: IO port probe 0x800-0x80f: clean.
cs: IO port probe 0x3e0-0x4ff: excluding 0x4d0-0x4d7
cs: IO port probe 0x100-0x3af: clean.
cs: IO port probe 0xa00-0xaff: clean.
cdrom: open failed.
e1000: eth0: e1000_watchdog: NIC Link is Up 1000 Mbps Full Duplex
ieee80211_crypt_wep: unsupported module, tainting kernel.
ieee80211_crypt: registered algorithm 'WEP'
NET: Registered protocol family 17
usbcore: registered new driver hiddev
input: USB HID v1.00 Mouse [0430:0100] on usb-0000:00:1d.1-1
```

```
usbcore: registered new driver usbhid
drivers/usb/input/hid-core.c: v2.01:USB HID core driver
eth0: no IPv6 routers present
Bluetooth: Core ver 2.7
NET: Registered protocol family 31
Bluetooth: HCI device and connection manager initialized
Bluetooth: HCI socket layer initialized
load_module: err 0xffffffef (dont worry)
Bluetooth: L2CAP ver 2.7
Bluetooth: L2CAP socket layer initialized
load_module: err 0xffffffef (dont worry)
Bluetooth: HIDP (Human Interface Emulation) ver 1.1
Bluetooth: RFCOMM ver 1.5
Bluetooth: RFCOMM socket layer initialized
Bluetooth: RFCOMM TTY layer initialized
Non-volatile memory driver v1.2
eth1: no IPv6 routers present
drivers/usb/serial/usb-serial.c: USB Serial support registered for Generic
usbcore: registered new driver usbserial_generic
usbcore: registered new driver usbserial
drivers/usb/serial/usb-serial.c: USB Serial Driver core v2.0
mtrr: 0xe0000000,0x2000000 overlaps existing 0xe0000000,0x1000000
end_request: I/O error, dev fd0, sector 0
```

Neu:

```
   startpar       - paralleles abarbeiten der init-Scripts
                    /etc/init.d/.depend.start
                    /etc/init.d/.depend.stop
                    /etc/init.d/.depend.boot
```

```
SunOS mit Kommando dmesg:

SuperSPARC: PAC ENABLED
SunOS Release 4.1.3 (BELLUS) #2: Fri Jun 16 16:08:49 MET DST 1995
Copyright (c) 1983-1992, Sun Microsystems, Inc.
cpu = SUNW,SPARCstation-10
mod0 = TI,TMS390Z50 (mid = 8)
mem = 48752K (0x2f9c000)
avail mem = 44986368
cpu0 at Mbus 0x8 0x230000
entering uniprocessor mode
Ethernet address = 8:0:20:1d:8d:30
espdma0 at SBus slot f 0x400000
esp0 at SBus slot f 0x800000 pri 4 (onboard)
sd0 at esp0 target 3 lun 0
sd0: <SUN1.05 cyl 2036 alt 2 hd 14 sec 72>
sr0 at esp0 target 6 lun 0
ledma0 at SBus slot f 0x400010
le0 at SBus slot f 0xc00000 pri 6 (onboard)
SUNW,bpp0 at SBus slot f 0x4800000 pri 3 (sbus level 2)
SUNW,DBRIe0 at SBus slot f 0x8010000 pri 9 (sbus level 5)
cgsix0 at SBus slot 2 0x0 pri 9 (sbus level 5)
cgsix0: screen 1152x900, single buffered, 1M mappable, rev 8
zs0 at obio 0x100000 pri 12 (onboard)
zs1 at obio 0x0 pri 12 (onboard)
SUNW,fdtwo0 at obio 0x700000 pri 11 (onboard)
MMCODEC: manufacturer id 1, rev 2
root on sd0a fstype 4.2
swap on sd0b fstype spec size 69552K
dump on sd0b fstype spec size 69540K
```

```
le0: Twisted Pair Ethernet
NFS lookup failed for server hp832: RPC: Timed out
```

SOLARIS mit Kommando dmesg:
/var/adm/messages

Oct 16 09:31:16 condor

```
genunix: [ID 540533 kern.notice]
MSunOS Release 5.10 Version Generic_139555-08 64-bit
 genunix: [ID 943908 kern.notice] Copyright 1983-2009 Sun Microsystems, Inc.
 Use is subject to license terms.
 genunix: [ID 678236 kern.info] Ethernet address = 0:21:28:44:79:be
 unix: [ID 200854 kern.info] NOTICE: DR Kernel Cage is ENABLED
 unix: [ID 389951 kern.info] mem = 33554432K (0x800000000)
 unix: [ID 930857 kern.info] avail mem = 33441013760
 rootnex: [ID 466748 kern.info] root nexus = Sun SPARC Enterprise M4000 Serve
 rootnex: [ID 349649 kern.info] pseudo0 at root
 genunix: [ID 936769 kern.info] pseudo0 is /pseudo
 rootnex: [ID 349649 kern.info] scsi_vhci0 at root
 genunix: [ID 936769 kern.info] scsi_vhci0 is /scsi_vhci
 rootnex: [ID 349649 kern.info] px0 at root: SAFARI 0x0 0x600000
 genunix: [ID 936769 kern.info] px0 is /pci@0,600000
 px: [ID 236367 kern.info] PCI Express-device: pci@0, pxb_plx0
 genunix: [ID 936769 kern.info] pxb_plx0 is /pci@0,600000/pci@0
 pxb_plx: [ID 370704 kern.info] PCI-device: pci@8, pxb_plx1
 genunix: [ID 936769 kern.info] pxb_plx1 is /pci@0,600000/pci@0/pci@8
 pxb_plx: [ID 370704 kern.info] PCI-device: pci@0, px_pci0
 genunix: [ID 936769 kern.info] px_pci0 is /pci@0,600000/pci@0/pci@8/pci@0
 scsi: [ID 365881 kern.info] /pci@0,600000/pci@0/pci@8/pci@0/scsi@1 (mpt0):
        initiator SCSI ID now 7
 scsi: [ID 365881 kern.info] /pci@0,600000/pci@0/pci@8/pci@0/scsi@1 (mpt0):
```

```
        Rev. 2 LSI, Inc. 1064 found.
scsi: [ID 365881 kern.info] /pci@0,600000/pci@0/pci@8/pci@0/scsi@1 (mpt0):
        mpt0 supports power management.
scsi: [ID 365881 kern.info] /pci@0,600000/pci@0/pci@8/pci@0/scsi@1 (mpt0):
        mpt0 Firmware version v1.b.0.0 (IT)
scsi: [ID 365881 kern.info] /pci@0,600000/pci@0/pci@8/pci@0/scsi@1 (mpt0):
        mpt0: IOC Operational.
scsi: [ID 243001 kern.info] /pci@0,600000/pci@0/pci@8/pci@0/scsi@1 (mpt0):
        mpt0: Initiator WWNs: 0x508002000027a5c-0x508002000027a5f
px_pci: [ID 370704 kern.info] PCI-device: scsi@1, mpt0
genunix: [ID 936769 kern.info] mpt0 is /pci@0,600000/pci@0/pci@8/pci@0/scsi@
scsi: [ID 193665 kern.info] sd1 at mpt0: target 0 lun 0
genunix: [ID 936769 kern.info] sd1 is /pci@0,600000/pci@0/pci@8/pci@0/scsi@1
genunix: [ID 408114 kern.info] /pci@0,600000/pci@0/pci@8/pci@0/scsi@1/sd@0,0
swapgeneric: [ID 308332 kern.info] root on /pci@0,600000/pci@0/pci@8/pci@0/s
pseudo: [ID 129642 kern.info] pseudo-device: dr0
genunix: [ID 936769 kern.info] dr0 is /pseudo/dr@0
pseudo: [ID 129642 kern.info] pseudo-device: dld0
genunix: [ID 936769 kern.info] dld0 is /pseudo/dld@0
rootnex: [ID 349649 kern.info] oplmsu0 at root
genunix: [ID 936769 kern.info] oplmsu0 is /pseudo-console
rootnex: [ID 349649 kern.info] pcicmu0 at root: SAFARI 0x8 0x4000
genunix: [ID 936769 kern.info] pcicmu0 is /pci@8,4000
genunix: [ID 408114 kern.info] /pci@8,4000 (pcicmu0) online
pcicmu: [ID 370704 kern.info] PCI-device: ebus@1, ebus0
genunix: [ID 936769 kern.info] ebus0 is /pci@8,4000/ebus@1
genunix: [ID 408114 kern.info] /pci@8,4000/ebus@1 (ebus0) online
ebus: [ID 521012 kern.info] su0 at ebus0: offset 14,400000
genunix: [ID 936769 kern.info] su0 is /pci@8,4000/ebus@1/serial@14,400000
genunix: [ID 408114 kern.info] /pci@8,4000/ebus@1/serial@14,400000 (su0) onl
```

```
ebus: [ID 521012 kern.info] scfd0 at ebus0: offset 14,200000
genunix: [ID 936769 kern.info] scfd0 is /pci@8,4000/ebus@1/scfc@14,200000
genunix: [ID 408114 kern.info] /pci@8,4000/ebus@1/scfc@14,200000 (scfd0) onl
ebus: [ID 521012 kern.info] oplpanel0 at ebus0: offset 14,280030
genunix: [ID 936769 kern.info] oplpanel0 is /pci@8,4000/ebus@1/panel@14,2800
genunix: [ID 408114 kern.info] /pci@8,4000/ebus@1/panel@14,280030 (oplpanel0
unix: [ID 950921 kern.info] cpu0: SPARC64-VII (portid 1024 impl 0x7 ver 0x91
unix: [ID 950921 kern.info] cpu1: SPARC64-VII (portid 1024 impl 0x7 ver 0x91
unix: [ID 557827 kern.info] cpu1 initialization complete - online
   ......
unix: [ID 950921 kern.info] cpu30: SPARC64-VII (portid 1048 impl 0x7 ver 0x9
unix: [ID 557827 kern.info] cpu30 initialization complete - online
unix: [ID 950921 kern.info] cpu31: SPARC64-VII (portid 1048 impl 0x7 ver 0x9
unix: [ID 557827 kern.info] cpu31 initialization complete - online
rootnex: [ID 349649 kern.info] iscsi0 at root
genunix: [ID 936769 kern.info] iscsi0 is /iscsi
pxb_plx: [ID 370704 kern.info] PCI-device: pci@0,1, px_pci1
genunix: [ID 936769 kern.info] px_pci1 is /pci@0,600000/pci@0/pci@8/pci@0,1
rootnex: [ID 349649 kern.info] mc-opl0 at root: SAFARI 0x200 0x200 ...
genunix: [ID 936769 kern.info] mc-opl0 is /pseudo-mc@200,200
pxb_plx: [ID 370704 kern.info] PCI-device: pci@9, pxb_plx2
genunix: [ID 936769 kern.info] pxb_plx2 is /pci@0,600000/pci@0/pci@9
mac: [ID 469746 kern.info] NOTICE: bge0 registered
bge: [ID 801725 kern.info] NOTICE: bge0: link down (initialized)
genunix: [ID 454863 kern.info] dump on /dev/dsk/c0t0d0s1 size 4104 MB
pseudo: [ID 129642 kern.info] pseudo-device: zfs0
genunix: [ID 936769 kern.info] zfs0 is /pseudo/zfs@0
pseudo: [ID 129642 kern.info] pseudo-device: devinfo0
genunix: [ID 936769 kern.info] devinfo0 is /pseudo/devinfo@0
pseudo: [ID 129642 kern.info] pseudo-device: tod0
```

```
 genunix: [ID 936769 kern.info] tod0 is /pseudo/tod@0
 pseudo: [ID 129642 kern.info] pseudo-device: pm0
 genunix: [ID 936769 kern.info] pm0 is /pseudo/pm@0
 bge: [ID 801725 kern.info] NOTICE: bge0: link up 1000Mbps Full-Duplex (initi
 pseudo: [ID 129642 kern.info] pseudo-device: fcode0
 genunix: [ID 936769 kern.info] fcode0 is /pseudo/fcode@0
 pseudo: [ID 129642 kern.info] pseudo-device: oplkmdrv0
 genunix: [ID 936769 kern.info] oplkmdrv0 is /pseudo/oplkmdrv@0
 pseudo: [ID 129642 kern.info] pseudo-device: dm2s0
 genunix: [ID 936769 kern.info] dm2s0 is /pseudo/dm2s@0
 pppd[282]: [ID 860527 daemon.notice] pppd 2.4.0b1 (Sun Microsystems, Inc.) s
 pppd[282]: [ID 702911 daemon.notice] Connect: sppp0 <--> /dev/dm2s0
 pppd[282]: [ID 702911 daemon.notice] local  IP address 10.1.1.2
 pppd[282]: [ID 702911 daemon.notice] remote IP address 10.1.1.1
 pseudo: [ID 129642 kern.info] pseudo-device: dtrace0
 genunix: [ID 936769 kern.info] dtrace0 is /pseudo/dtrace@0
 pseudo: [ID 129642 kern.info] pseudo-device: pool0
 genunix: [ID 936769 kern.info] pool0 is /pseudo/pool@0
 pseudo: [ID 129642 kern.info] pseudo-device: vol0
 genunix: [ID 936769 kern.info] vol0 is /pseudo/vol@0
 scsi: [ID 193665 kern.info] sd0 at mpt0: target 1 lun 0
 genunix: [ID 936769 kern.info] sd0 is /pci@0,600000/pci@0/pci@8/pci@0/scsi@1
 genunix: [ID 408114 kern.info] /pci@0,600000/pci@0/pci@8/pci@0/scsi@1/sd@1,0
 scsi: [ID 193665 kern.info] sd2 at mpt0: target 3 lun 0
 genunix: [ID 936769 kern.info] sd2 is /pci@0,600000/pci@0/pci@8/pci@0/scsi@1
 genunix: [ID 408114 kern.info] /pci@0,600000/pci@0/pci@8/pci@0/scsi@1/sd@3,0
) unknown; sleeping for retry
) unknown; sleeping for retry
 pseudo: [ID 129642 kern.info] pseudo-device: devinfo0
 genunix: [ID 936769 kern.info] devinfo0 is /pseudo/devinfo@0
```

```
) -- using short name
) -- using short name
 svc.startd[7]: [ID 694882 daemon.notice] instance svc:/system/console-login:
 scsi: [ID 193665 kern.info] sd0 at mpt0: target 1 lun 0
 genunix: [ID 936769 kern.info] sd0 is /pci@0,600000/pci@0/pci@8/pci@0/scsi@1
 rootnex: [ID 349649 kern.info] px1 at root: SAFARI 0x1 0x700000
 genunix: [ID 936769 kern.info] px1 is /pci@1,700000
 rootnex: [ID 349649 kern.info] px2 at root: SAFARI 0x2 0x600000
 genunix: [ID 936769 kern.info] px2 is /pci@2,600000
 rootnex: [ID 349649 kern.info] px3 at root: SAFARI 0x3 0x700000
 genunix: [ID 936769 kern.info] px3 is /pci@3,700000
 rootnex: [ID 349649 kern.info] ramdisk0 at root
 genunix: [ID 936769 kern.info] ramdisk0 is /ramdisk-root
 pseudo: [ID 129642 kern.info] pseudo-device: pseudo1
 genunix: [ID 936769 kern.info] pseudo1 is /pseudo/zconsnex@1
 pseudo: [ID 129642 kern.info] pseudo-device: ramdisk1024
 genunix: [ID 936769 kern.info] ramdisk1024 is /pseudo/ramdisk@1024
 pseudo: [ID 129642 kern.info] pseudo-device: lockstat0
 genunix: [ID 936769 kern.info] lockstat0 is /pseudo/lockstat@0
 pseudo: [ID 129642 kern.info] pseudo-device: llc10
 genunix: [ID 936769 kern.info] llc10 is /pseudo/llc1@0
 pseudo: [ID 129642 kern.info] pseudo-device: tod0
 genunix: [ID 936769 kern.info] tod0 is /pseudo/tod@0
 pseudo: [ID 129642 kern.info] pseudo-device: lofi0
 genunix: [ID 936769 kern.info] lofi0 is /pseudo/lofi@0
 mac: [ID 469746 kern.info] NOTICE: bge1 registered
 pseudo: [ID 129642 kern.info] pseudo-device: trapstat0
 genunix: [ID 936769 kern.info] trapstat0 is /pseudo/trapstat@0
 pseudo: [ID 129642 kern.info] pseudo-device: fbt0
 genunix: [ID 936769 kern.info] fbt0 is /pseudo/fbt@0
```

```
pseudo: [ID 129642 kern.info] pseudo-device: profile0
genunix: [ID 936769 kern.info] profile0 is /pseudo/profile@0
pseudo: [ID 129642 kern.info] pseudo-device: systrace0
genunix: [ID 936769 kern.info] systrace0 is /pseudo/systrace@0
pseudo: [ID 129642 kern.info] pseudo-device: sdt0
genunix: [ID 936769 kern.info] sdt0 is /pseudo/sdt@0
pseudo: [ID 129642 kern.info] pseudo-device: fasttrap0
genunix: [ID 936769 kern.info] fasttrap0 is /pseudo/fasttrap@0
pseudo: [ID 129642 kern.info] pseudo-device: mem_cache0
genunix: [ID 936769 kern.info] mem_cache0 is /pseudo/mem_cache@0
pseudo: [ID 129642 kern.info] pseudo-device: wrsmd0
genunix: [ID 936769 kern.info] wrsmd0 is /pseudo/wrsmd@0
pseudo: [ID 129642 kern.info] pseudo-device: wrsmd1
genunix: [ID 936769 kern.info] wrsmd1 is /pseudo/wrsmd@1
pseudo: [ID 129642 kern.info] pseudo-device: wrsmd2
genunix: [ID 936769 kern.info] wrsmd2 is /pseudo/wrsmd@2
    .....
pseudo: [ID 129642 kern.info] pseudo-device: wrsmd14
genunix: [ID 936769 kern.info] wrsmd14 is /pseudo/wrsmd@14
pseudo: [ID 129642 kern.info] pseudo-device: wrsmd15
genunix: [ID 936769 kern.info] wrsmd15 is /pseudo/wrsmd@15
pseudo: [ID 129642 kern.info] pseudo-device: fcp0
genunix: [ID 936769 kern.info] fcp0 is /pseudo/fcp@0
pseudo: [ID 129642 kern.info] pseudo-device: fcsm0
genunix: [ID 936769 kern.info] fcsm0 is /pseudo/fcsm@0
pseudo: [ID 129642 kern.info] pseudo-device: fssnap0
genunix: [ID 936769 kern.info] fssnap0 is /pseudo/fssnap@0
pseudo: [ID 129642 kern.info] pseudo-device: winlock0
genunix: [ID 936769 kern.info] winlock0 is /pseudo/winlock@0
pseudo: [ID 129642 kern.info] pseudo-device: pm0
```

```
genunix: [ID 936769 kern.info] pm0 is /pseudo/pm@0
pseudo: [ID 129642 kern.info] pseudo-device: rsm0
genunix: [ID 936769 kern.info] rsm0 is /pseudo/rsm@0
ipf: [ID 774698 kern.info] IP Filter: v4.1.9, running.
```

Neu:

paralleles abarbeiten der init-Scripts

SMF - Service Managment Facility

```
DEC-OSF File: /var/adm/messages:
     (verkürzt)

vmunix: panic (cpu 0): bad dir
syncing disks... done
Alpha boot: available memory from 0x6c0000 to 0x4000000
DEC OSF/1 V3.0 (Rev. 347); Fri Aug 25 13:22:40 MET DST 1995
physical memory = 64.00 megabytes.
available memory = 54.78 megabytes.
using 238 buffers containing 1.85 megabytes of memory
tc0 at nexus
scc0 at tc0 slot 7
tcds0 at tc0 slot 6
scsi0 at tcds0 slot 0
rz0 at scsi0 bus 0 target 0 lun 0 (DEC      RZ26     (C) DEC 392A)
rz3 at scsi0 bus 0 target 3 lun 0 (DEC      RZ26L    (C) DEC 440C)
rz4 at scsi0 bus 0 target 4 lun 0 (DEC      RRD42    (C) DEC 4.5d)
tz5 at scsi0 bus 0 target 5 lun 0 (DEC      TLZ06    (C) DEC 0491)
scsi1 at tcds0 slot 1
rz8 at scsi1 bus 1 target 0 lun 0 (DEC      RZ28     (C) DEC 435E)
rz9 at scsi1 bus 1 target 1 lun 0 (DEC      RZ28     (C) DEC 435E)
rz10 at scsi1 bus 1 target 2 lun 0 (DEC     RZ28     (C) DEC 435E)
rz11 at scsi1 bus 1 target 3 lun 0 (DEC     RZ28     (C) DEC 435E)
bba0 at tc0 slot 7
ln0: DEC LANCE Module Name: PMAD-BA
ln0 at tc0 slot 7
ln0: DEC LANCE Ethernet Interface, hardware address:
                                              08-00-2B-3E-18-80
fta0: DEC DEFTA FDDI Module Name: PMAF-FA
```

```
fta0 at tc0 slot 0
fta0: DMA Available.
fta0: DEC DEFTA (PDQ) FDDI Interface, Hardware address:
                                                08-00-2B-A2-B4-49
fta0: Firmware rev:  1.1
tcds1 at tc0 slot 4
scsi2 at tcds1 slot 0
rz16 at scsi2 bus 2 target 0 lun 0 (DEC     RZ28     (C) DEC 435E)
rz17 at scsi2 bus 2 target 1 lun 0 (DEC     RZ28     (C) DEC 435E)
rz18 at scsi2 bus 2 target 2 lun 0 (DEC     RZ28     (C) DEC 435E)
rz19 at scsi2 bus 2 target 3 lun 0 (DEC     RZ28     (C) DEC 435E)
rz20 at scsi2 bus 2 target 4 lun 0 (DEC     RZ28     (C) DEC 435E)
scsi3 at tcds1 slot 1
tz28 at scsi3 bus 3 target 4 lun 0 (DEC     TLZ7      (C)DEC 4BQD)
DEC3000 - M800 system
Firmware revision: 5.1
PALcode: OSF version 1.35
lvm0: configured.
lvm1: configured.
SuperLAT. Copyright 1993 Meridian Technology Corp.
                                            All rights reserved.
dli: configured
fta0: Link Unavailable.
fta0: Link Available.
NFS server: stale file handle fs(8,36866) file 54523 gen 818875302
getattr, client address = 141.20.22.146, errno 22
```

Konfigurationsfiles für das Booten

SunOS (klassisches BSD-System):

Script-Files:

- /etc/rc.boot
- /etc/rc.ip
- /etc/rc.single
- /etc/rc
- /etc/rc.local

Datenfiles:

/fastboot	– ob fastboot
/etc/hostname.??0	– Hostname für Interface
/etc/defaultrouter	– default Router
/etc/defaultdomain	– default NIS-Domain
/etc/ttytab	

Ablauf:

/usr/etc/init [-bs]
  /etc/rc.boot
    single-user /etc/rc.ip, /etc/rc.single
    oder
    multi-user /etc/rc, /etc/rc.local
    getty aufsetzen (abhängig von /etc/inittab)

Solaris 2.1-2.9 (klassisches AT&T System V):

Script-Files:

```
/etc/rc0  -  shutdown                                  /sbin/rc0
/etc/rc1  -  Administrationstatus - single-user  /sbin/rc1
/etc/rc2  -  Multiuser mit Netzwerk                /sbin/rc2
/etc/rc3  -  Multiuser mit NFS                         /sbin/rc3
/etc/rc5  -  shutdown                                  /sbin/rc5
/etc/rc6  -  shutdown                                  /sbin/rc6
/etc/rcS  -  Singeluser                                /sbin/rcS
/etc/rc[0123S].d/*  - Startup/Shutdown-Scripte
       /etc/rc2.d/S69inet start  - Aufruf eines Startup-Scripts
       /etc/rc2.d/K16apache stop - Aufruf eines Shutdown-Scripts
/etc/init.d/*  - Muster für alle Startup/Shutdown-Scripte
```

Datenfiles:

```
/etc/inittab
/etc/default/init
/etc/defaultdomain
/etc/defaultrouter
```

Ablauf:

/sbin/init – /sbin/init [0123456abcQqSs]

/etc/default/init

/etc/inittab

Eintrag in inittab:
id:rstate:action:process
id – 1..2 Buchstaben
rstate – run level

action – Verhalten (respawn, wait, once, boot, bootwait, powerfail, powerwait, off, initdefault, sysinit)
prozess – abzuarbeitendes Programm/Script

Beispiel Solaris 2.8:

```
ap::sysinit:/sbin/autopush -f /etc/iu.ap
ap::sysinit:/sbin/soconfig -f /etc/sock2path
fs::sysinit:/sbin/rcS sysinit >/dev/msglog 2<>/dev/msglog </dev/co
is:3:initdefault:
p3:s1234:powerfail:/usr/sbin/shutdown -y -i5 -g0 >/dev/msglog 2<>/
sS:s:wait:/sbin/rcS  >/dev/msglog 2<>/dev/msglog </dev/console
s0:0:wait:/sbin/rc0  >/dev/msglog 2<>/dev/msglog </dev/console
s1:1:respawn:/sbin/rc1 >/dev/msglog 2<>/dev/msglog </dev/console
s2:23:wait:/sbin/rc2  >/dev/msglog 2<>/dev/msglog </dev/console
s3:3:wait:/sbin/rc3  >/dev/msglog 2<>/dev/msglog </dev/console
s5:5:wait:/sbin/rc5  >/dev/msglog 2<>/dev/msglog </dev/console
s6:6:wait:/sbin/rc6  >/dev/msglog 2<>/dev/msglog </dev/console
fw:0:wait:/sbin/uadmin 2 0  >/dev/msglog 2<>/dev/msglog </dev/cons
of:5:wait:/sbin/uadmin 2 6  >/dev/msglog 2<>/dev/msglog </dev/cons
rb:6:wait:/sbin/uadmin 2 1  >/dev/msglog 2<>/dev/msglog </dev/cons
sc:234:respawn:/usr/lib/saf/sac -t 300
co:234:respawn:/usr/lib/saf/ttymon -g -h -p \
                    "`uname -n` console login: " \
                    -T sun -d /dev/console -l console \
                    -m ldterm,ttcompat
ift::boot:/etc/.iftraidagent
```

Nun werden die RC-Files entsprechend /etc/inittab abgearbeitet.

Solaris 10: Alles wird durch SMF (Service Management Facility) verwaltet.
Klassisches System V Methode nur noch für Unverbesserliche im Notfall.
Start durch svc.startd.

/etc/inittab existiert aber trotzdem
Beispiel Solaris 10:

```
# The /etc/inittab file controls the configuration of init(1M); fo
# information refer to init(1M) and inittab(4).
#
## svccfg
# svc:> select system/console-login
# svc:/system/console-login> setprop ttymon/terminal_type = "xterm
# svc:/system/console-login> exit
#
ap::sysinit:/sbin/autopush -f /etc/iu.ap
sp::sysinit:/sbin/soconfig -f /etc/sock2path
smf::sysinit:/lib/svc/bin/svc.startd \
                >/dev/msglog 2<>/dev/msglog </dev/console
p3:s1234:powerfail:/usr/sbin/shutdown -y -i5 -g0 \
                  >/dev/msglog 2<>/dev/msglog
```

Ein Service wird durch eine Konfigurationsdatei beschrieben (XML-Datei), die Abhängigkeiten und auszuführenden Aktionen entält. Zusätzlich gibt es eventue eine Methoden-Datei (Shellscript), die auszuführende Kommandos enthält (analo dem alten Verfahren). Das Ausführen von Aktionen bzw. das Starten der Methode wird durch den svc.startd (Service Managment Facility master restarter) und den svc.configd (Service Managment Facility repository daemon) gesteuert.

Kommandos für die SMF

```
    svcs    –  report service status
                  svcs –a
                  svcs –x ssh
    svcadm  –  manipulate service instances
                  svcadm enable ssh
                  svcadm disable ssh
                  svcadm restart ssh
    svccfg  –  import, export and modify service configurations
                  svccfg import cswspamd.xml
                  svccfg delete svc:/network/radius
                  svccfg –s svc:/system/filesystem/volfs listprop vold/*

    svcprop –  retrieve values of service configuration properties
                  svcprop –p httpd/ssl svc:/network/http:apache2
```

XML–Files unter:

```
    /var/svc/manifest/
    /var/svc/manifest/network
    /opt/csw/var/svc/manifest/
    /opt/csw/var/svc/manifest/network
```

Methodenfiles unter:

```
    /lib/svc/method
    /opt/csw/lib/svc/method
```

Beispiel Apache2

Methodenfile:

```
<?xml version="1.0"?>
<!DOCTYPE service_bundle SYSTEM "/usr/share/lib/xml/dtd/service_bundle.dt
<service_bundle type='manifest' name='SUNWapch2r:apache'>
  <service
      name='network/http'
      type='service'
            version='1'>
      <!--
        Because we may have multiple instances of network/http
        provided by different implementations, we keep dependencies
        and methods within the instance.
      -->
      <instance name='apache2' enabled='false'>
            <!--
              Wait for network interfaces to be initialized.
            -->
            <dependency name='network'
                grouping='require_all'
                restart_on='error'
                type='service'>
                <service_fmri value='svc:/milestone/network:default'/>
            </dependency>
            <!--
              Wait for all local filesystems to be mounted.
            -->
            <dependency name='filesystem-local'
```

```
        grouping='require_all'
        restart_on='none'
        type='service'>
        <service_fmri
            value='svc:/system/filesystem/local:default'/>
    </dependency>
    <!--
      Wait for automounting to be available, as we may be
      serving data from home directories or other remote
      filesystems.
    -->
    <dependency name='autofs'
        grouping='optional_all'
        restart_on='error'
        type='service'>
        <service_fmri
            value='svc:/system/filesystem/autofs:default'/>
    </dependency>
    <exec_method
            type='method'
            name='start'
            exec='/lib/svc/method/http-apache2 start'
            timeout_seconds='60' />
    <exec_method
            type='method'
            name='stop'
            exec='/lib/svc/method/http-apache2 stop'
            timeout_seconds='60' />
    <exec_method
            type='method'
```

```
                        name='refresh'
                        exec='/lib/svc/method/http-apache2 refresh'
                        timeout_seconds='60' />
                <property_group name='httpd' type='application'>
                        <stability value='Evolving' />
                        <propval name='ssl' type='boolean' value='false' />
                </property_group>
                <property_group name='startd' type='framework'>
                        <!-- sub-process core dumps shouldn't restart
                                session -->
                        <propval name='ignore_error' type='astring'
                                value='core,signal' />
                </property_group>
        </instance>
        <stability value='Evolving' />
        <template>
                <common_name>
                        <loctext xml:lang='C'>
                                Apache 2 HTTP server
                        </loctext>
                </common_name>
                <documentation>
                        <manpage title='httpd' section='8'
                                manpath='/usr/apache2/man' />
                        <doc_link name='apache.org'
                                uri='http://httpd.apache.org' />
                </documentation>
        </template>
    </service>
</service_bundle>
```

Methodenfile:

```
#!/sbin/sh
#
# Copyright 2004 Sun Microsystems, Inc.  All rights reserved.
# Use is subject to license terms.
#
# ident     "@(#)http-apache2       1.2     04/11/11 SMI"
#

. /lib/svc/share/smf_include.sh

APACHE_HOME=/usr/apache2
CONF_FILE=/etc/apache2/httpd.conf
PIDFILE=/var/run/apache2/httpd.pid

[ ! -f ${CONF_FILE} ] &&  exit $SMF_EXIT_ERR_CONFIG

case "$1" in
start)
        /bin/rm -f ${PIDFILE}
        /bin/mkdir -p /var/run/apache2
        ssl=‘svcprop -p httpd/ssl svc:/network/http:apache2‘
        if [ "$ssl" = false ]; then
                cmd="start"
        else
                cmd="startssl"
        fi
        ;;
```

```
refresh)
        cmd="graceful"
        ;;
stop)
        cmd="stop"
        ;;
*)
        echo "Usage: $0 {start|stop|refresh}"
        exit 1
        ;;
esac

exec ${APACHE_HOME}/bin/apachectl $cmd 2>&1
```

```
OSF:
   Script-Files:
      /etc/rc0  -  Halt
      /etc/rc2  -  Multiuser
      /etc/rc3  -  Multiuser mit Netzwerk
      /sbin/rc[023].d/*
      /sbin/init.d/*
   Datenfiles:
      /etc/inittab
      /etc/rc.config
      /etc/routes
   Ablauf:
      /sbin/init - /sbin/init [023qs]
        /etc/inittab
           Eintrag in inittab:
               Identifier:Runlevel:Action:Command
                   Runlevel - 0,2,3,S,s
                   Action   - respawn, wait, once,
                              boot, bootwait,
                              powerfail, powerwait,
                              off,initdefault, sysinit
           Beispiel:
           # OSF/1 Release 1.0
           is:3:initdefault:
           ss:Ss:wait:/sbin/rc0 shutdown  \
                        < /dev/console > /dev/console 2>&1
           s0:0:wait:/sbin/rc0 off </dev/console >/dev/console 2>&1
           fs:23:wait:/sbin/bcheckrc </dev/console >/dev/console 2>&1
           sysconfig:Ss:sysinit:/sbin/init.d/autosysconfig start ....
           update:23:wait:/sbin/update > /dev/console 2>&1
```

```
it:23:wait:/sbin/it < /dev/console > /dev/console 2>&1
kmk:3:wait:/sbin/kmknod > /dev/console 2>&1
s2:23:wait:/sbin/rc2 < /dev/console > /dev/console 2>&1
s3:3:wait:/sbin/rc3 < /dev/console > /dev/console 2>&1
cons:1234:respawn:/usr/sbin/getty console console vt100
```

Nun werden die RC-Files entsprechend inittab abgearbeitet.

```
AIX:
  Script-Files:
     /etc/rc.boot          /etc/rc
     /etc/rc.bsdnet        /etc/rc/ncs
     /etc/rc.net           /etc/rc.nfs
     /etc/rc.powerfail     /etc/rc.tcpip
  Datenfiles:
     /etc/inittab
  Ablauf:
     /etc/init - /etc/init [0123456789abcQqSsMmN]
         Eintrag in inittab:
           Identifier:RunLevel:Action:Command
      Beispiel:
        init:2:initdefault:
        brc::sysinit:/sbin/rc.boot 3 >/dev/console 2>&1 \
        # Phase 3 of system boot
        powerfail::powerfail:/etc/rc.powerfail >/dev/console 2>&1
        rc:2:wait:/etc/rc > /dev/console 2>&1
        # Multi-User checks
        fbcheck:2:wait:/usr/lib/dwm/fbcheck >/dev/console 2>&1 \
                              # run /etc/firstboot
        srcmstr:2:respawn:/etc/srcmstr \
                              # System Resource Controller
        rctcpip:2:wait:/etc/rc.tcpip > /dev/console 2>&1
                              # Start TCP/IP dämons
        rcnfs:2:wait:/etc/rc.nfs > /dev/console 2>&1 \
                              # Start NFS Dämons
        cons:0123456789:respawn:/etc/getty /dev/console
        piobe:2:wait:/bin/rm -f /usr/lpd/pio/flags/*  \
                              # Clean up printer flags files
```

```
cron:2:respawn:/etc/cron
qdaemon:2:wait:/bin/startsrc -sqdaemon
writesrv:2:wait:/bin/startsrc -swritesrv
uprintfd:2:respawn:/etc/uprintfd
rcncs:2:wait:sh /etc/rc.ncs
lpd:2:once:startsrc -s lpd
tty0:2:off:/etc/getty /dev/tty0
tty1:2:off:/etc/getty /dev/tty1
infod:2:once:startsrc -s infod
```

```
HPUX 9.5:
   Script-Files:
     /etc/rc
     /etc/bcheckrc
     /etc/brc
     /etc/lvmrc
     /etc/netbsdsrc
     /etc/netlinkrc
     /etc/netlsrc
     /etc/netncsrc
     /etc/netnfsrc
     /etc/netnfsrc2
     /etc/netnmrc
     /etc/omrc
     /etc/src.csh
     /etc/src.sh
     /etc/pre_init_rc
   Datenfiles:
     /etc/inittab
   Ablauf:
      /etc/pre_init_rc
      /etc/init - /etc/init [0123456SsQq]
        Beispiel für /etc/inittab:
          io::sysinit:/etc/ioinit -i > /dev/console 2>&1
          is:2:initdefault:
          mx::sysinit:/etc/dasetup < /dev/console > /dev/console 2>&1
          bl::bootwait:/etc/bcheckrc </dev/console >/dev/cons...
          slib::bootwait:/etc/recoversl </dev/console >/dev/c...
          bc::bootwait:/etc/brc 1>/dev/console 2>&1
          sl::wait:/bin/sh -c "/bin/rm -f /dev/syscon; /bin/ln /dev/systty /d
```

```
rc::wait:/bin/sh /etc/rc </dev/console 1>/dev/console 2>&1
co:12:respawn:/etc/getty console console
c1:2:respawn:/etc/getty -h tty0p1 9600
#c2:2:respawn:/usr/lib/uucp/uugetty -h tty0p2 9600
c4:2:respawn:/etc/getty -h tty0p4 9600
c5:2:respawn:/etc/getty -h tty0p5 9600
c6:2:off:/etc/getty -h tty0p6 9600
c7:2:off:/etc/getty -h tty0p7 9600
pf::powerwait:/etc/powerfail >/dev/console 2>&1
xdm:2:off:/usr/bin/X11/xdm -nodaemon < /dev/null > ...
```

LINUX (SuSE)

Script-Files in:

/etc/init.d/

/etc/init.d/rc0.d, ..., /etc/init.d/rc6.d, /etc/init.d/rcS.d

Spezielle Scriptfiles:

/etc/init.d/boot, /etc/init.d/boot.local

/etc/init.d/halt, /etc/init.d/halt.local

/etc/init.d/rc

/etc/init.d/reboot, /etc/init.d/single

Konfigurationsfiles für Komponenten:

/etc/inittab

/etc/rc.config # bis SuSE 7.3

/etc/sysconfig/* # ab SuSE 11.1

apache2	fonts-config	nagios	suseconfig
arpwatch	hardware/	network/	SuSEfirewall2
atd	ide	news	SuSEfirewall2.d/
auditd	irda	nfs	susehelp
autofs	irqbalance	ntp	suse_register
backup	ispell	postfix	svnserve
bluetooth	joystick	proxy	sysctl
boot	kernel	rpcbind	syslog
bootloader	keyboard	scpm	ulimit
bootsplash	language	scripts/	uuidd
clock	ldap	security	windowmanager
console	lirc	services	words
cron	lvm	shutdown	xendomains
cups	mail	sound	yast2
displaymanager	mdadm	spamd	ypbind
dmraid	mouse	ssh	

Modifikation von /etc/sysconfig/*

vi /etc/sysconfig/postfix

problematisch, da nicht bekannt ist, was eventuell "yast2" bei einem späteren Reconfigure macht!!!

besser:

yast2
System
/etc/sysconfig Editor
Applications
Desktop
Hardware
Network
Other
System
Bei dem Rest muss man raten oder es wissen!?

Ablauf:

/sbin/init – /sbin/init [–t sec] [0123456SsQq]

Eintrag in inittab:
id:runlevels:action:process
runlevels: –0123456S
action:

respawn	– Prozess neu starten
wait	– warten bis Prozess zu Ende ist
once	– einmalig bei Runlevelwechsel
boot	– bei Systemstart
bootwait	– bei Systemstart und warten
off	– Eintrag ohne Funktion
onedemand	– wenn runlevel aufgerufen wird
initdefault	– Standard–Runlevel
sysinit	– starten vor boot und bootwait
powerwait	– Stromversorgung wechselt auf USV (Signal)
powerfail	– Fehler in der Stromversorgung (sofort)
powerokwait	– Stromversorgung wieder ok
powerfailnow	– USV ist leer (sofort)
resume	– nach Suspend
ctrlaltdel	–
kbdrequest	–

Beispiel /etc/inittab:

```
# Copyright (c) 1996-2002 SuSE Linux AG, Nuernberg, Germany.  All
# Author: Florian La Roche, 1996
# Please send feedback to http://www.suse.de/feedback
# This is the main configuration file of /sbin/init, which
# is executed by the kernel on startup. It describes what
# scripts are used for the different run-levels.
# All scripts for runlevel changes are in /etc/init.d/.
# This file may be modified by SuSEconfig unless CHECK_INITTAB
# in /etc/sysconfig/suseconfig is set to "no"
# The default runlevel is defined here
id:5:initdefault:
# First script to be executed, if not booting in emergency (-b) mo
si::bootwait:/etc/init.d/boot
# /etc/init.d/rc takes care of runlevel handling
# runlevel 0  is  System halt   (Do not use this for initdefault!)
# runlevel 1  is  Single user mode
# runlevel 2  is  Local multiuser without remote network (e.g. NFS
# runlevel 3  is  Full multiuser with network
# runlevel 4  is  Not used
# runlevel 5  is  Full multiuser with network and xdm
# runlevel 6  is  System reboot (Do not use this for initdefault!)
l0:0:wait:/etc/init.d/rc 0
l1:1:wait:/etc/init.d/rc 1
l2:2:wait:/etc/init.d/rc 2
l3:3:wait:/etc/init.d/rc 3
#l4:4:wait:/etc/init.d/rc 4
l5:5:wait:/etc/init.d/rc 5
l6:6:wait:/etc/init.d/rc 6
```

```
            # what to do in single-user mode
            ls:S:wait:/etc/init.d/rc S
            ~~:S:respawn:/sbin/sulogin
            # what to do when CTRL-ALT-DEL is pressed
            ca::ctrlaltdel:/sbin/shutdown -r -t 4 now
            # special keyboard request (Alt-UpArrow)
            # look into the kbd-0.90 docs for this
            kb::kbrequest:/bin/echo "Keyboard Request -- edit /etc/inittab to
            # what to do when power fails/returns
            pf::powerwait:/etc/init.d/powerfail start
            pn::powerfailnow:/etc/init.d/powerfail now
            #pn::powerfail:/etc/init.d/powerfail now
            po::powerokwait:/etc/init.d/powerfail stop
            # for ARGO UPS
            sh:12345:powerfail:/sbin/shutdown -h now THE POWER IS FAILING
            # getty-programs for the normal runlevels
            # <id>:<runlevels>:<action>:<process>
            # The "id" field  MUST be the same as the last
            # characters of the device (after "tty").
            1:2345:respawn:/sbin/mingetty --noclear tty1
            2:2345:respawn:/sbin/mingetty tty2
            3:2345:respawn:/sbin/mingetty tty3
            4:2345:respawn:/sbin/mingetty tty4
            5:2345:respawn:/sbin/mingetty tty5
            6:2345:respawn:/sbin/mingetty tty6
          ....
Dokumentation des Bootvorganges in /etc/init.d/README
Musterfile für Startscript
       /etc/init.d/skeleton
```

Startscripts:

aaeventd	boot.lvm	microcode.ctl	rpasswdd
acpid	boot.md	multipathd	rpcbind
alsasound	boot.multipath	nagios	rpmconfigcheck
apache2	boot.open-iscsi	network	rsyncd
arpwatch	boot.proc	network-remotefs	setserial
atd	boot.rootfsck	nfs	single
auditd	boot.sched	nscd	skeleton
autofs	boot.scpm	ntp	skeleton.compat
autoyast	boot.swap	openct	smartd
avahi-daemon	boot.sysctl	open-iscsi	smolt
avahi-dnsconfd	boot.udev	openvpn	smpppd
bgpd	boot.udev_retry	ospf6d	spamd
bluetooth	cron	ospfd	splash
bluetooth-coldplug	cups	pcscd	splash_early
boot	dbus	pm-profiler	sshd
boot.apparmor	dnsmasq	postfix	stopblktrace
boot.blktrace	earlysyslog	powerd	SuSEfirewall2_init
boot.cleanup	earlyxdm	powerfail	SuSEfirewall2_setup
boot.clock	fbset	random	svnserve
boot.crypto	gpm	raw	syslog
boot.crypto-early	haldaemon	rc	uuidd
boot.cycle	halt	rc0.d	vsftpd
boot.d	halt.local	rc1.d	waitfornm
boot.device-mapper	irda	rc2.d	xdm
boot.dmraid	irq_balancer	rc3.d	xend
boot.fuse	ivman	rc4.d	xendomains
boot.ipconfig	java.binfmt_misc	rc5.d	xfs
boot.klog	joystick	rc6.d	xinetd

```
boot.ldconfig       kbd                 rcS.d               ypbind
boot.loadmodules    kexec               README              zebra
boot.local          libvirtd            reboot
boot.localfs        lirc                ripd
boot.localnet       mdadmd              ripngd
```

Parallelisierung des Startvorgangs:

Programm:
startpar
Konfigurationsfiles:
/etc/init.d/.depend.boot
/etc/init.d/.depend.halt
/etc/init.d/.depend.start
/etc/init.d/.depend.stop

enthalten Abhängigkeiten für die Startscripts, so daß diese parallel gestartet werden können – funktioniert noch nicht in allen Lebenslagen!!??!

Manuelle Abschaltung des parallelen Startens:
/etc/sysconfig/boot
RUN_PARALLEL="no"

Zuordnen eines Dienstes zu einem Runlevel: insserv
/etc/insserv.conf

Regeln für das Verändern von Start-Scripten

Hinzufügen von neuen Scripten ist weniger gefährlich als das Modifizieren von vorhandenen Standardscripten (Seiteneffekte)!!!

1. Prüfen ob für die gewünschte neue Funktionalität schon ein Standardscript existiert und man nur ein Konfigurationsfile ändern muß.
2. Verändere nie Standardscripte, die für das Initialisieren des Grundsystems notwendig sind.
3. Füge lieber ein neues Script hinzu.
4. Erzeuge ein neues Script durch Kopiern und Modifizieren eines Standardscriptes.

Richtlinien für das Schreiben von Boot-Scripten:

- vollständige Pfadnamen benutzen
- Systemzustand berücksichtigen
- Berücksichtigen von allen möglichen und unmöglichen Seiteneffekten
- Abhängigkeiten beachten
- geben sie alle Fehler aus!!!
- schreiben sie viele Kommentare.

Ein Fehler kann in ungünstigen Fällen zum Blockieren des Systems führen oder zum Öffnen der Systemkonsole für jedermann. Also: Testen, Testen, ...

Herunterfahren von UNIX-Systemen

Netzstecker ziehen ?!!!???!!!

Warum nicht?

1. **Eventuell nach dem Einschalten viel Arbeit für den Admin.**
2. **Prügel der eingeloggten Nutzer für den Admin.**

Nur wenn der Rechner brennt.

Bei planmäßigen Wartungsarbeiten:

1. **Nutzer mehrere Tage vorher mehrmals informieren**
2. **Alle eingeloggten Nutzer nochmals mindestens 10 Minuten vorher informieren.**
3. **Subsysteme mit den dafür vorgesehenen Kommando herunterfahren. (Datenbanken, News-Server, FTP-Server,...) Bei guten Systemen sollte dies automatisch passieren. Shutdown-Scripte (K-Scripte)**
4. **Alle Nutzer ausloggen.**
5. **Plattensynchronisation erzwingen.**
6. **In den Single-User-Mode wechseln.**

Befehle zum Anhalten eines UNIX-Systems

init-Befehl: z.B. `init 6`, `telinit 6`
bewirkt den sofortigen Wechsel in den neuen Systemzustand

halt-Befehl: `halt`
anhalten des Systems, Rechner bleibt im Bootprompt stehen

poweroff-Befehl: `poweroff`
anhalten des Systems und ausschalten des Rechners

reboot-Befehl:
```
reboot -- -r
reboot -- -s
reboot
```
anhalten des Systems und System anschließend wieder neu booten mit entsprechenden Boot-Optionen

shutdown-Befehl (betriebssystemabhängig):

Linux:
```
shutdown -h now   "sofort anhalten"
shutdown -r now   "reboot"
shutdown -r -f now  "fast reboot"
```

Solaris
```
shutdown  -g 600 -i  5  "jetzt ist Schluss"
shutdown  -g 600 -i  6  "reboot"
shutdown  -g 600 -i  s  "single-user"
```