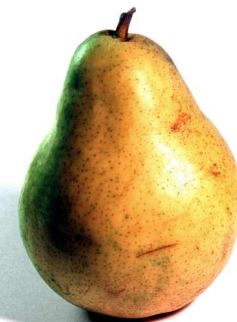**Part 2:**

**Linux
& Outlook**

Concepts & Implementation
FCP for zSeries

GSE Frühjahrstagung 2005, Berlin, 18.-20.5. 2005
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Part 2 - Agenda

Kernel 2.6 Concepts
Recent Linux Distributions
Multipathing
Supported Devices
Examples of Use
Summary & Outlook

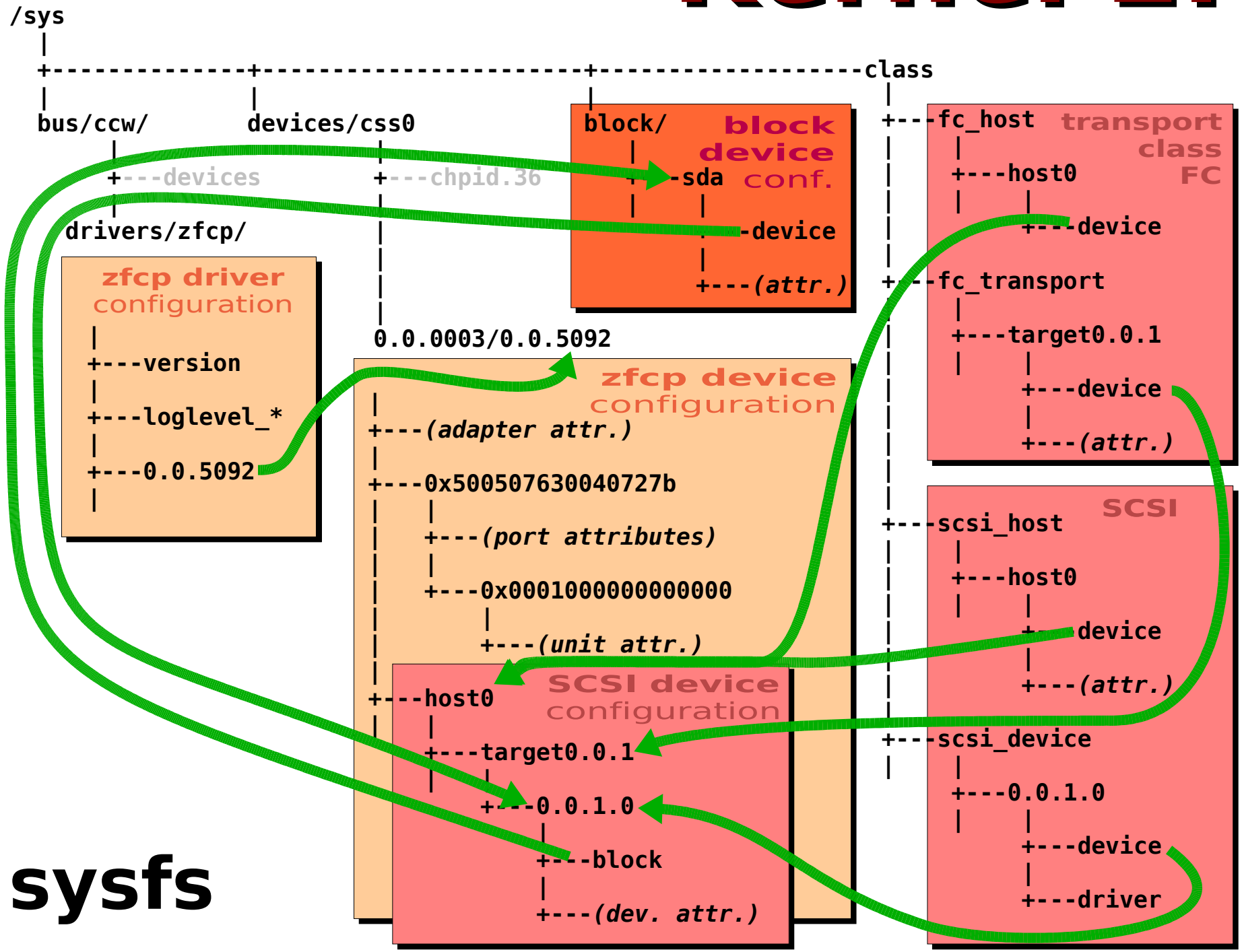Concepts & Implementation

FCP for zSeries

zfcp Setup

**change to the
zfcp directory in sysfs**

```
cd /sys/bus/ccw/drivers/zfcp
```

**pick detected FCP subchannel
you are going to use**

```
cd 0.0.50d4
```

set FCP subchannel online

```
echo 1 > online
```

**configure an FCP device by
adding a target port's WWPN**

```
echo 0x5005076300c20b8e > port_add
```

pick the newly added port

```
cd 0x5005076300c20b8e
```

**configure logical units
(e.g. volumes of disk storage)
by adding their FCP_LUNs**

```
echo 0x5256000000000000 > unit_add
echo 0x525e000000000000 > unit_add
echo 0x525f000000000000 > unit_add
```

Linux for zSeries and S/390 Device Drivers, Features, and Commands
http://awlinux1.alphaworks.ibm.com/developerworks/linux390/docu/l26bdd00.pdf

Tools

photo:
gardening tools

```
[root@tel15v39 root]# lsscsi -d
[0:0:1:0]    disk    IBM      2105F20            .487  /dev/sda[8:0]
[0:0:1:1]    disk    IBM      2105F20            .487  /dev/sdb[8:16]
[0:0:1:2]    disk    IBM      2105F20            .487  /dev/sdc[8:32]

[root@tel15v39 root]# lsscsi -l
[0:0:1:0]    disk    IBM      2105F20            .487  /dev/sda
  state=running queue_depth=32 scsi_level=4 type=0 device_blocked=0
[0:0:1:1]    disk    IBM      2105F20            .487  /dev/sdb
  state=running queue_depth=32 scsi_level=4 type=0 device_blocked=0
[0:0:1:2]    disk    IBM      2105F20            .487  /dev/sdc
  state=running queue_depth=32 scsi_level=4 type=0 device_blocked=0

[root@tel15v39 root]# scsi_id -s /block/sda
1IBM     2105            25614735
[root@tel15v39 root]# scsi_id -s /block/sdb
1IBM     2105            25E14735
[root@tel15v39 root]# scsi_id -s /block/sdc
1IBM     2105            25F14735
```
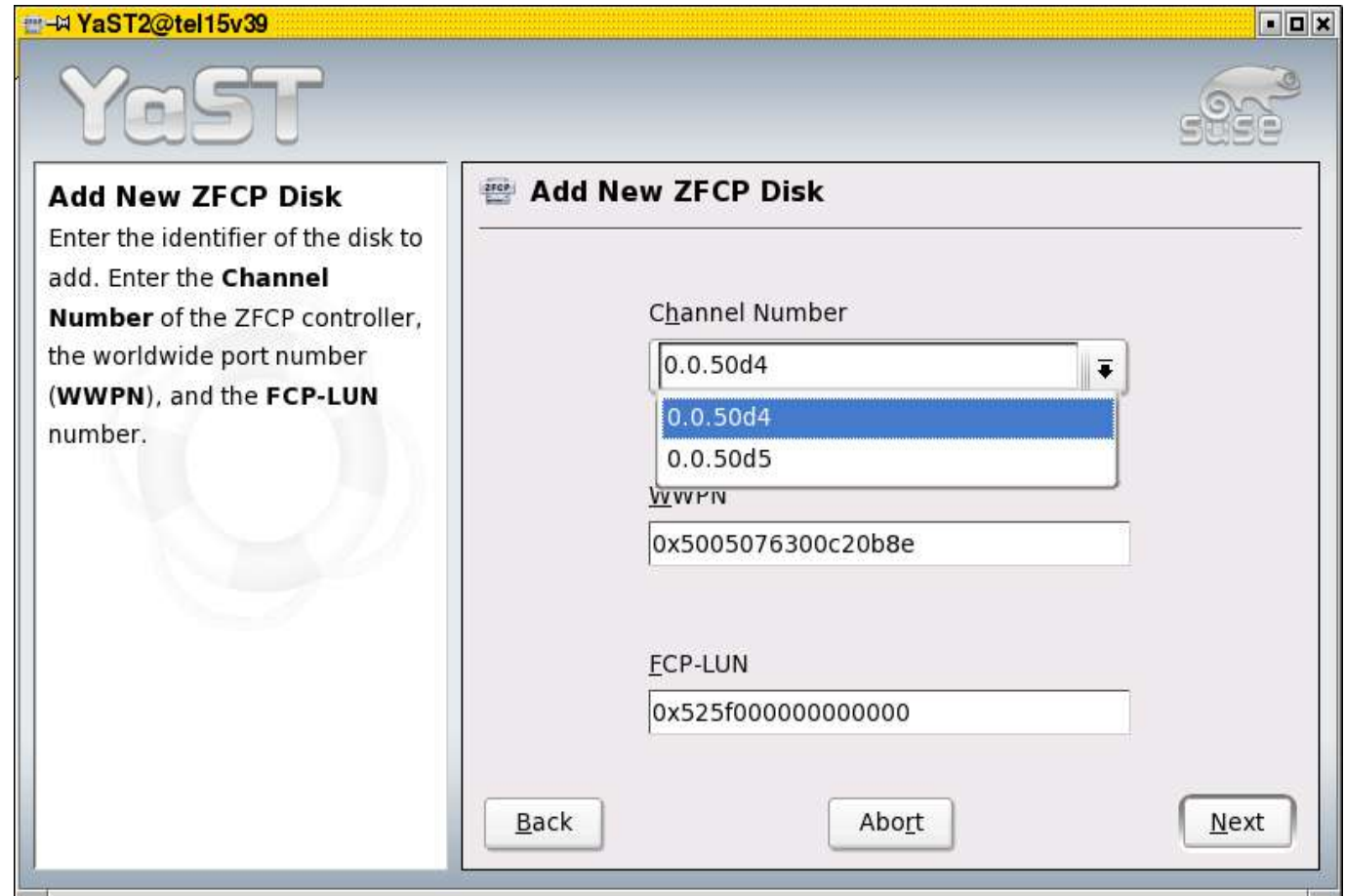
SLES9
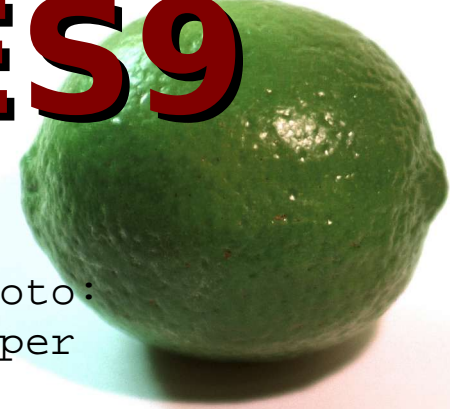
➔ **new zfcp dialog in *YaST* simplifies setup of SAN attached devices**

change photo:
green pepper

autodetects available FCP subchannels

copy'n paste WWPNs and FCP_LUNs from configuration file obtained from SAN management tools or administrator

SLES9

Persistent Device Names

photo:
green pepper

```
tel15v39:~ # insserv boot.udev

tel15v39:~ # ls -Al /dev/disk/*
/dev/disk/by-id:
1IBM_2105_25F14735 -> ../../sda
1IBM_2105_25F14735p1 -> ../../sda1
1IBM_2105_25F14735p2 -> ../../sda2
/dev/disk/by-path:
ccw-0.0.50d4-zfcp-0x5005076300c20b8e:0x525f000000000000 -> ../../sda
ccw-0.0.50d4-zfcp-0x5005076300c20b8e:0x525f000000000000p1 -> ../../sda1
ccw-0.0.50d4-zfcp-0x5005076300c20b8e:0x525f000000000000p2 -> ../../sda2

tel15v39:~ # head -n 2 /etc/fstab
/dev/disk/by-id/1IBM_2105_25F14735p2   /       ext3   acl,user_xattr   1 1
/dev/disk/by-id/1IBM_2105_25F14735p1   swap    swap   pri=42           0 0

tel15v39:~ # mkinitrd

tel15v39:~ # zipl
```

see also *SLES9 Documentation*

http://www.novell.com/documentation/sles9/

Concepts & Implementation
FCP for zSeries
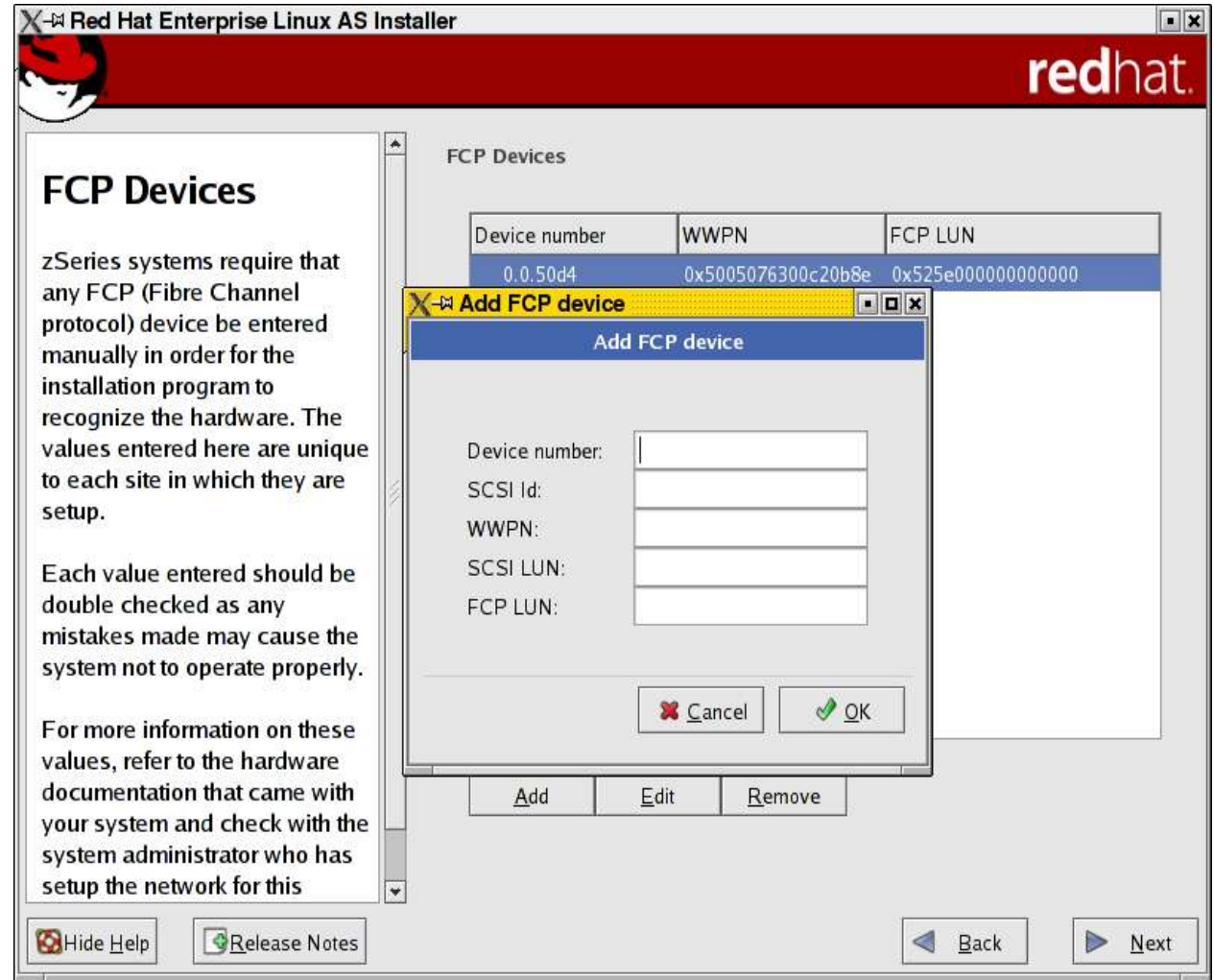
Attention:

**SCSI ID and SCSI LUN
shouldn't be needed.
Be careful with
assignments, though.
SCSI ID: 1, 2, 3, ...
SCSI LUN: 0, 1, 2, ...**

**Ignore subsequent
complaints in case of
DASD-less system.**

**GUI only available
during installation.
Use sysfs for addition
of more FCP devices.
Define FCP devices in
/etc/zfcp.conf for
permanent addition.**

X-⋈ Red Hat Enterprise Linux AS Installer

redhat.

FCP Devices

zSeries systems require that any FCP (Fibre Channel protocol) device be entered manually in order for the installation program to recognize the hardware. The values entered here are unique to each site in which they are setup.

Each value entered should be double checked as any mistakes made may cause the system not to operate properly.

For more information on these values, refer to the hardware documentation that came with your system and check with the system administrator who has setup the network for this

FCP Devices

Device number	WWPN	FCP LUN
0.0.50d4	0x5005076300c20b8e	0x525e000000000000

X-⋈ **Add FCP device**

Add FCP device

Device number: |
SCSI Id:
WWPN:
SCSI LUN:
FCP LUN:

✖ Cancel   ✔ OK

Add   Edit   Remove

🔴Hide Help   ⊕Release Notes   ◀ Back   ▶ Next

Multipathing

EVMS

➔ **all-purpose storage management tool which is among many other things capable of setting up a multipath disk access**

➔ <u>**attention**</u>**: make sure to learn the EVMS terminology and read available documentation before setting out on a long quest – otherwise frustration is guaranteed**

Enterprise Volume Management System
evms.sourceforge.net   www.tldp.org/LDP/EVMSUG/

The Linux Multipath Implementation
http://christophe.varoqui.fr/multipath.html

photo:
"Waldenbuch" – "hcubnedlaW"

md

configure paths of FCP devices

create md multipath array with all paths

query UUID of md multipath array

permanently add array by UUID for more reliability

only use md device!

```
[root@tel15v39 device]# cat /etc/zfcp.conf
0.0.50d4 0x01 0x5005076300c20b8e 0x0 0x525e000000000000
0.0.50d4 0x01 0x5005076300c20b8e 0x1 0x526f000000000000
0.0.50d5 0x01 0x5005076300cc0b8e 0x0 0x526f000000000000

[root@tel15v39 ~]# mdadm -C /dev/md0 \
> --level=multipath \
> --raid-devices=2 /dev/sdb /dev/sdc
mdadm: array /dev/md0 started.

[root@tel15v39 ~]#  mdadm --examine --scan /dev/sd*
ARRAY /dev/md0 level=multipath num-devices=2
    UUID=6b083d48:2c1e2d54:9afaa3c0:f68cd8f3

[root@tel15v39 ~]# cat /etc/mdadm.conf
DEVICE /dev/sd*
ARRAY /dev/md0 level=multipath num-devices=2
    UUID=6b083d48:2c1e2d54:9afaa3c0:f68cd8f3

[root@tel15v39 ~]# mke2fs -j /dev/md0
[root@tel15v39 ~]# mount -t ext3 /dev/md0 \
> /mnt/md-multipath-disk/
```

Concepts & Implementation

FCP for zSeries

Supported Devices

	SLES8	RHEL3	SLES9	RHEL4
Tape System 3590, Drive 3592, Library 3494	supported	unsupported	supported	aiming for support
Tape Library 3584 (Ultrium 2 and 3 drives, 3592 drives)	supported	unsupported	supported	aiming for support
Tape Libraries 3581 U2, 3582, 3583 (Ultrium 2 and 3 drives)	supported	unsupported	supported	aiming for support
ESS 800, 750, F20, F10	supported	unsupported	in test	open
DS4300 (FAStT600)	supported	unsupported	open	open
DS4400 (FAStT700) DS4500 (FAStT900)	unsupported	unsupported	unsupported	open
DS6000	supported	unsupported	open	open
DS8000	supported	unsupported	aiming for support	aiming for support
non-IBM devices	unsupported	unsupported	unsupported	unsupported

color-coding:	supported	aiming for support	unsupported	open

see also *FCP for zSeries Connectivity* **http:// www.ibm.com/servers/eserver/zseries/connectivity/#fcp**

see also *IBM TotalStorage® (refer to interoperability matrices)* **http://www.storage.ibm.com/**
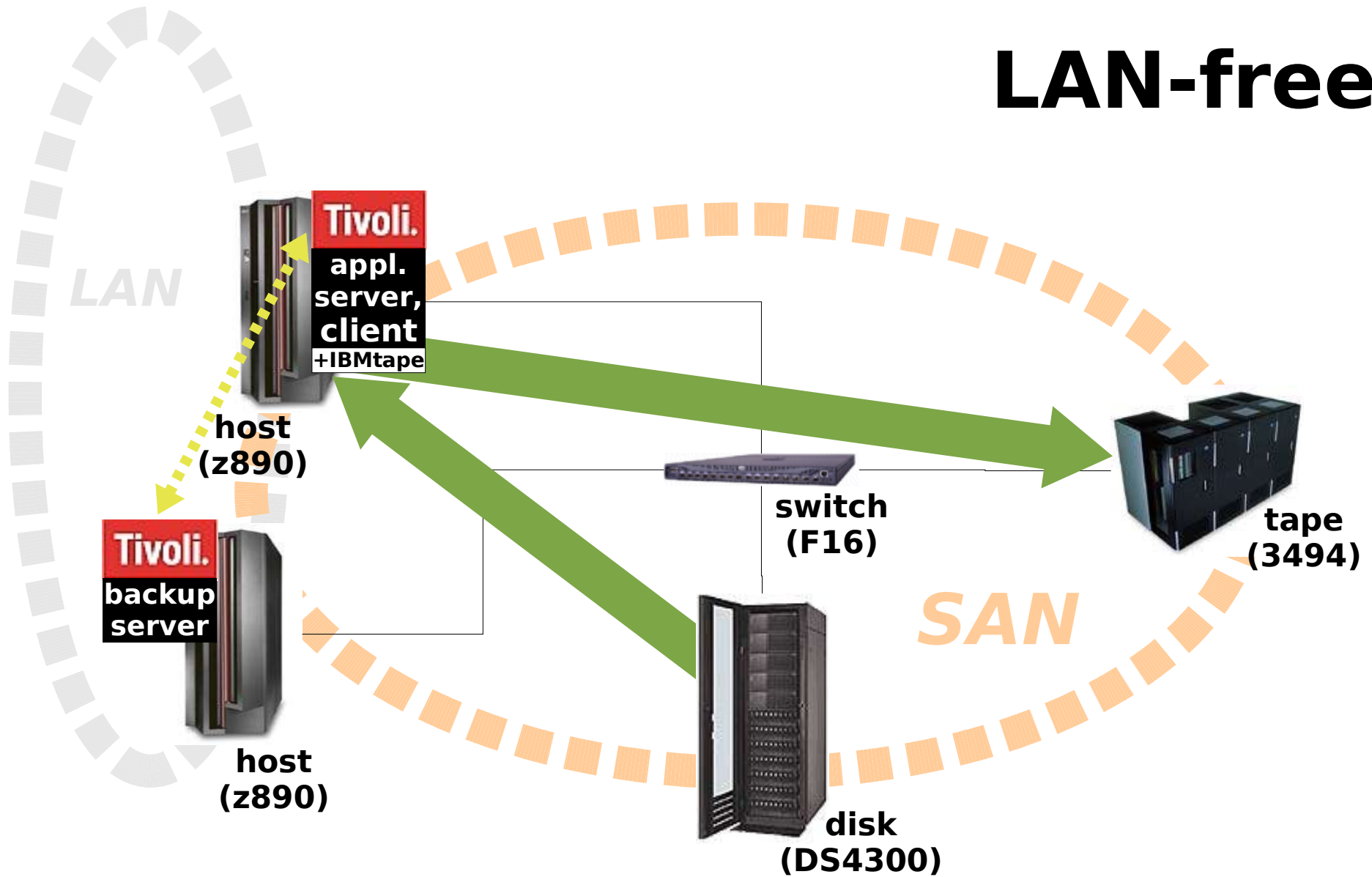
Backup Solution

IBMtape and TSM

➔ **"stand-alone" Linux backup solution without the need for help from z/OS**

➔ **TSM supports many SCSI tape devices, including OEM devices (IBM devices only supported by zSeries FCP so far)**

➔ **TSM facilitates modern SAN and SCSI features and provides efficient modes for backup and restore (LAN-free, server-free)**

➔ **both TSM client and TSM server are available for Linux on zSeries**

see also	*TSM server and client download* **ftp://service.boulder.ibm.com/ storage/tivoli-storage-management/maintenance/**

see also	*IBMtape download* **ftp://ftp.software.ibm.com/storage/devdrvr/Linux/**

Backup Solution

LAN-free

LAN

Tivoli.
appl.
server,
client
+IBMtape

**host
(z890)**

Tivoli.
backup
server

**host
(z890)**

**switch
(F16)**

**tape
(3494)**

SAN

**disk
(DS4300)**

More Good Uses

Include Anything Requiring High Throughput

➔ **as storage for databases: particularily, databases taking advantage of the 2.6 kernel's asynchronous and direct I/O capabilities should see noticable performance gains with FCP**

➔ **as fast swap device for systems that highly utilize swap**

➔ **as shared storage accessed through Samba**

Summary

photo:
"in a nutshell"

|	z/VM guests	z/VM CP	z/VSE	SLES	RHEL
SCSI over FC	4.3	5.1	3.1	8	4 (recommended)
SCSI IPL	4.4	5.1	3.1	8	4 (recommended)
direct installation from SCSI media	4.4	no	no	no	no
direct installation onto SCSI media	4.4	5.1	3.1	9	4
SCSI device types accessible		disk	disk	any	any
FBA emulation for SCSI disk	optional, by z/VM	required, by z/VM	required, by z/VSE or z/VM	optional, by z/VM (native SCSI recommended)	optional, by z/VM (native SCSI recommended)
multipathing	failover, failback, load balancing	failover, failback, load balancing	failover, failback (FBA emul. by z/VSE)	failover, failback, load balancing (not for root device)	failover, failback (not for root device)
persistent device naming	yes	yes	yes	yes	UUID of md as a circumvention

Outlook - Linux

Point-to-Point

➔ **will allow for inexpensive configurations more easily setup for the purpose of evaluating FCP for zSeries with Linux at customer sites**

Outlook - Linux

Fault Isolation

```
/var/log/messages:

SCSI error xyz ...
```

trace record
SCSI

trace record
ERP

trace record
FC
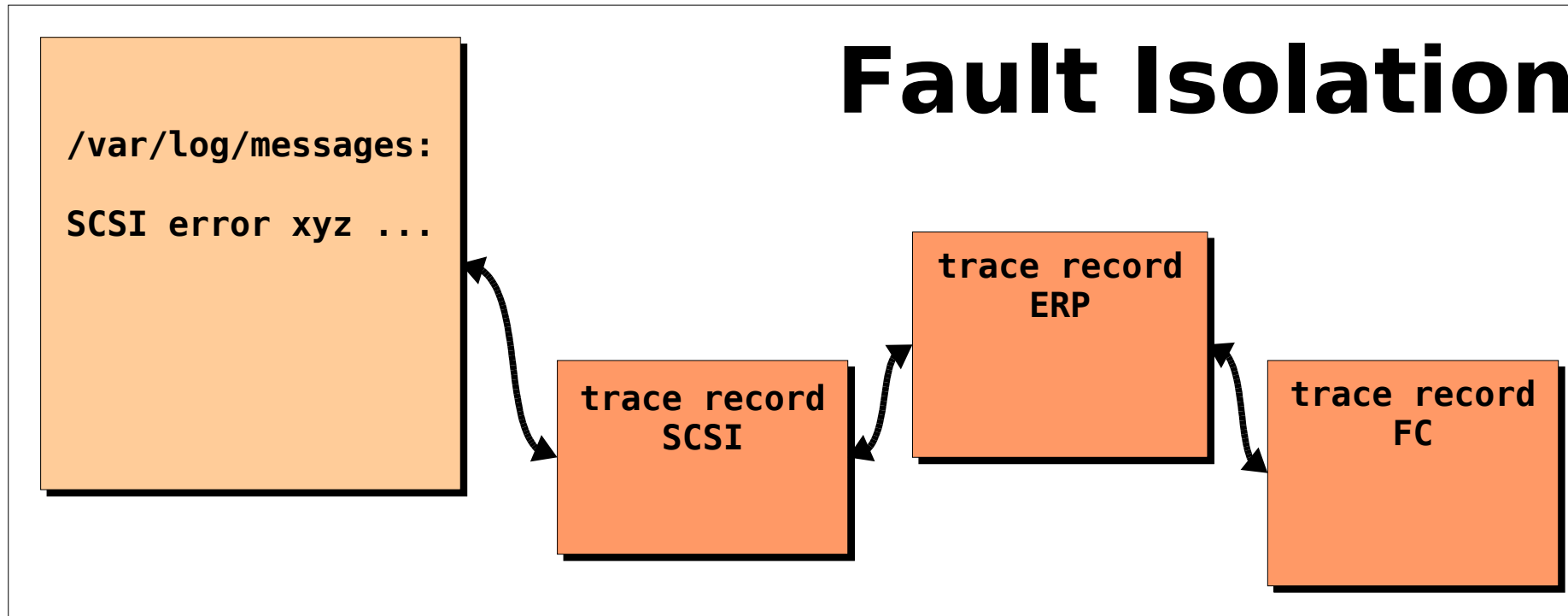
➔ **improving serviceability by restructuring the Linux for zSeries FCP device driver's error reporting and compiling a sort of zfcp troubleshooting guide**

More Security

see also	End-To-End Data Protection	http://www.t10.org/drafts.htm#sbc2 http://www.t10.org/drafts.htm#spc3
see also	High Integrity Fabric	ftp://ftp.t11.org/t11/pub/fc/fs-2/04-045v3.pdf

& More Speed

see also	4 Gigabit link speed	ftp://ftp.t11.org/t11/pub/fc/pi-2/04-217v3.pdf

Your Turn.

Questions
Feedback
Experiences
Customer Requests

>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>get back to us
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