Building Large Fabrics

or ...

... what have SAN´s and the Maldives in common?

Daily Business

- **Today: more than 50% of all SAN-Design discussion are about**

R E D E S I G N

Why ?

Do you know the Maledive effect?

- **180 K people on 298 sq.km**
- **2000 Islands**
- **760 km N/S, 130 km W/E**
- **Total 5180 sq.km**

... here it comes ...

Backup SAN

SAN-Island

SAN-Island

SAN-Island

FICON
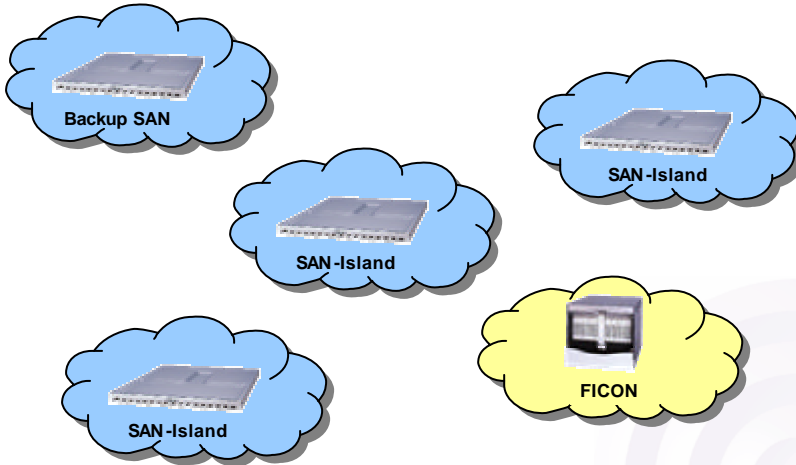
... SANs grow …
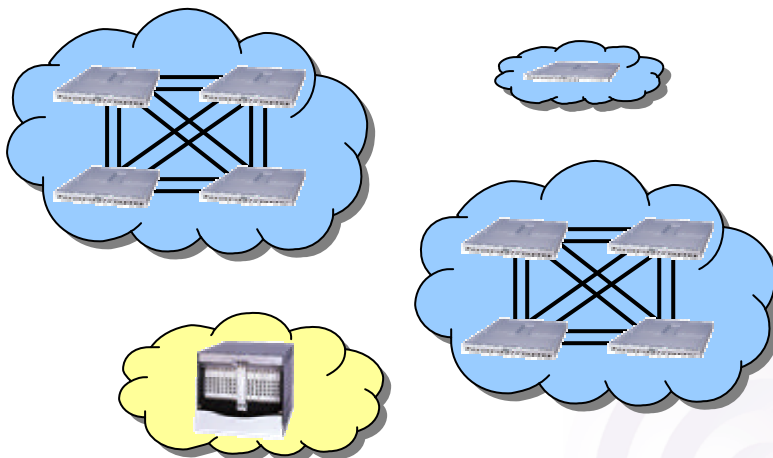
Fabric with 16-Port Switches

224 / 320 Ports useable
70% Ports useable
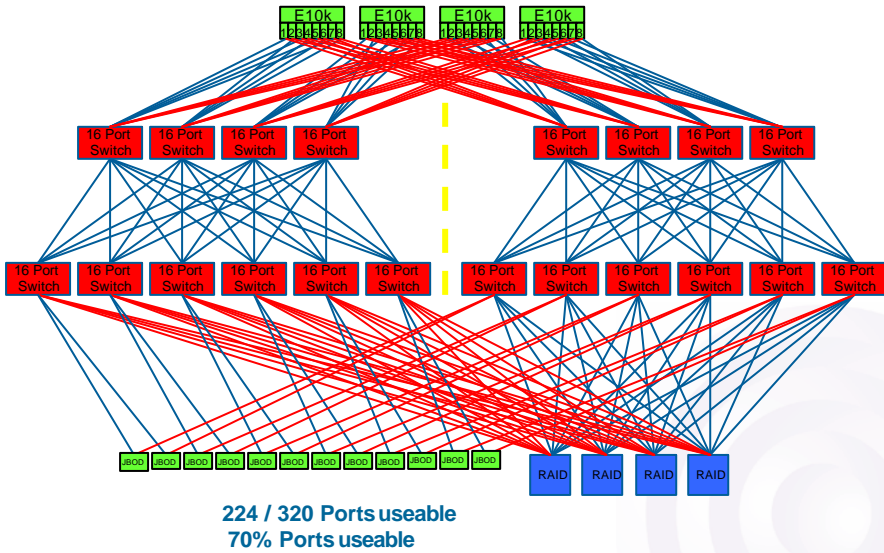
Fabric with 64 Port Directors

128 / 128 ports useable
➔ 100%

All RAID Links consists 6 Fibre Channel connections
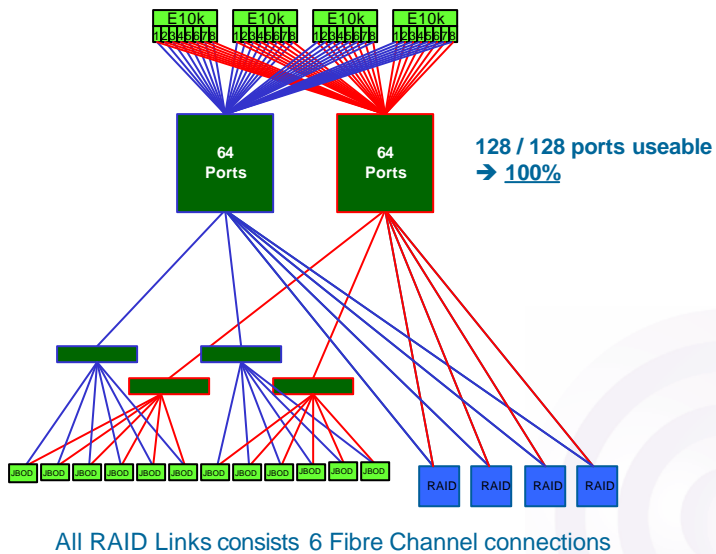
FC-Switch or FC-Director ?
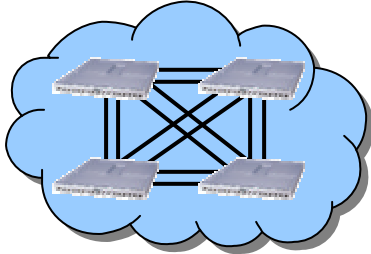
- 64 installed ports
- 40 usable ports
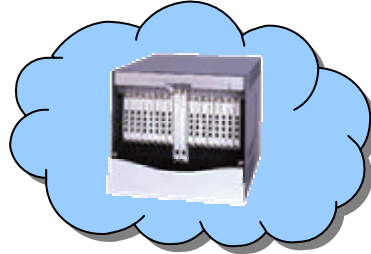- Upgrade steps: per unit (16/32 ports)
- Cost relation per usable port: 1,6*
    - Purchase
    - Maintenance
- max. 80% blocking
- only FCP support
- Heat output: factor 1,35
  (1.412 BTU per hr. ⇨ 40 ports)
- 99,99% availability

- 64 installed ports
- 64 usable ports
- Upgrade steps: per port card (4 ports)
- Cost relation per usable port : 1,5*
    - Purchase
    - Maintenance
- 100% non-blocking
- FCP and FICON support
- Heat output: factor 1
  (1.672 BTU per hr. ⇨ 64 ports)
- 99,999% availability

Islands oder Large Fabrics ?

?
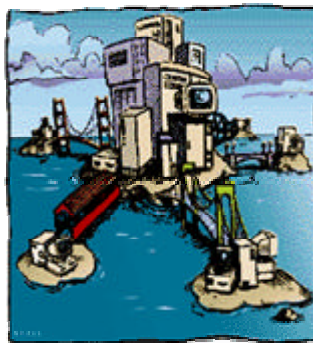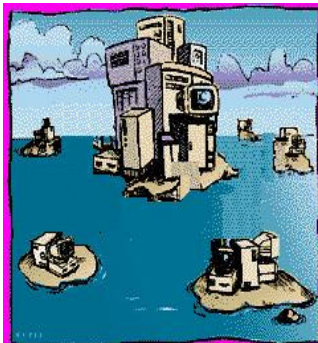
SAN Architectures

1-Tier Switch SAN

Availability 99,9%
- X Hardware Failure redundant (partial)
- X Logical Failure
- X Online Maintenance redundant (partial)
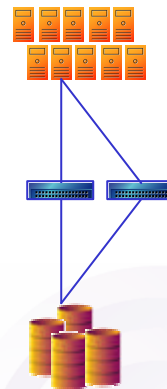
Connectivity
- ✓ Any to any
- • 32 Ports max

Performance - Best
- • 0 Hop, single latency
- • no interfabric routing

Scalability - limited
- • Limited to switch portcount
- • Today: 8-32 Ports
- • > 32 Ports – add. switches

1-Tier Dual Fabric Switch SAN

Availability 99,99%
- X Hardware Failure redundant (partial)
- ✓ Logical Failure redundant
- X Online Maintenance (partial)
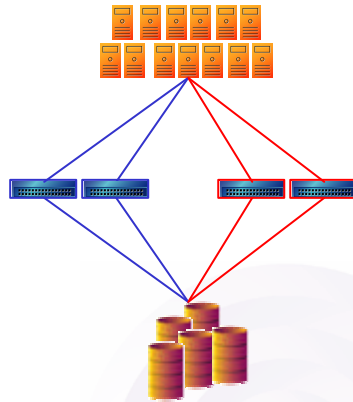- • Path Failover Software needed

Connectivity
- ✓ Any to any
- • 64 Ports max

Performance - Best
- • 0 Hop, single latency
- • no interfabric routing

Scalability - limited
- • Limited by Portcount
- • Today: 16-64 Ports
- • >64 Ports – add. switches

1-Tier Director SAN

Availability 99,999%
- ✓ Hardware Failure
- X Logical Failure
- ✓ Online Maintenance
- • Path Failover Software needed

Connectivity
- ✓ Any to any
- • 140 Ports max

Performance - Best
- • 0 Hop, single latency
- • no interfabric routing

Scalability - limited
- • Limited to Portcount
- • Today: 24-140 Ports
- • >140 Ports – Add. Director

1-Tier Dual Fabric Director SAN

Availability >99,999%
- ✓ Hardware Failure
- ✓ Logical Failure
- ✓ Online Maintenance
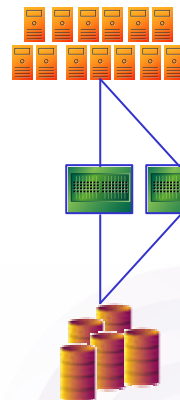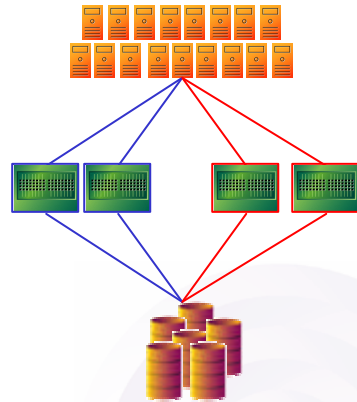- • Path Failover Software needed

Connectivity
- ✓ Any to any
- • 280 Ports max

Performance - Best
- • 0 Hop, single latency
- • no interfabric routing

Scalability - limited
- • Limited to Portcount
- • Today: 48-280 Ports
- • >280 Ports – Add. Director

2-Tier Dual Fabric SAN

Backbone Availability>99,999%
- ✓ Hardware Failure
- ✓ Logical Failure
- ✓ Online Maintenance
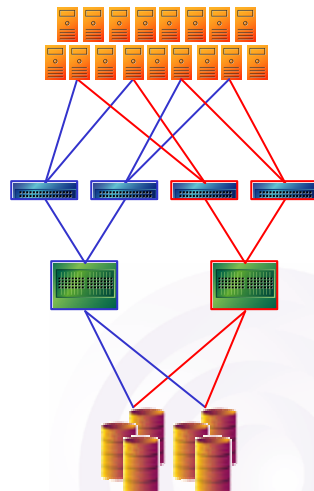- • **Path Failover Software needed**

Connectivity
- ✓ Any to any
- • Example up to 384 ports (6064)
- • Example up to 856 ports (6140)

Performance - High
- • 1 Hop, Double latency
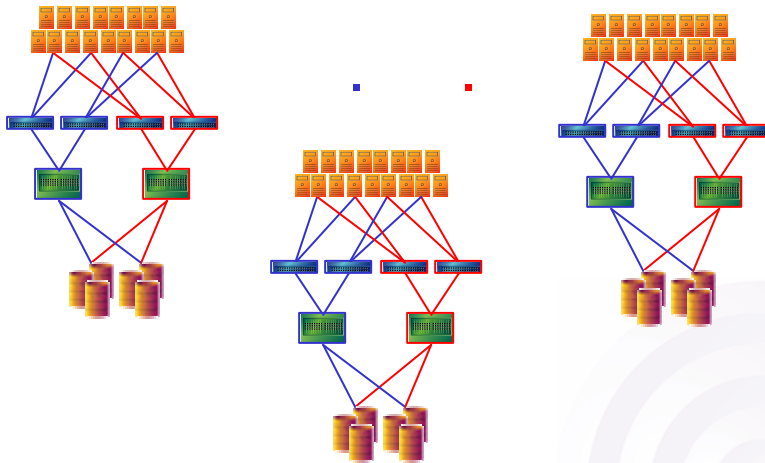- • Simple interfabric routing

Scalability - Large
- • Director Backbone „Port on demand"
- • 1st Tier switches or directors
- • Scalabil up to very large portcounts
- • Perfect conditions for island consolidation

Island consolidation

Concepts

What should be considered ...

- **Define your requirements**
  - Availability, Connectivity, Bandwith, Backup, Management
- **Define your SAN-Topology – Logical Design**
  - No. of Layer
  - Meshed- / Backbone Structure
- **Define your Partner – Physical Design**
  - Open approach – Interoperability support
  - Experience – References
  - Service
- **Define your Projectmanagement**
  - Planning / implementation / documentation

Define your requirements

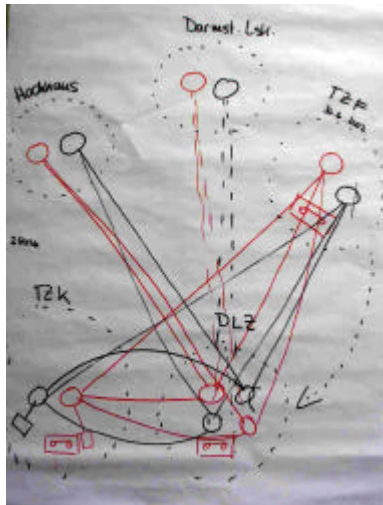**They drive your network design needs**

- **Application Uptime**
  - Network Availability
  - Data Protection
  - Network Performance
- **Information Sharing**
  - Distance Requirements
  - Any to any connectivity
- **Data Growth Expectations**
  - Scalability Needs
  - Choice of Building Block
  - Management Approach

- **Location of Data**
  - Consolidation / Distributed
  - MAN /WAN connectivity
  - Network Performance
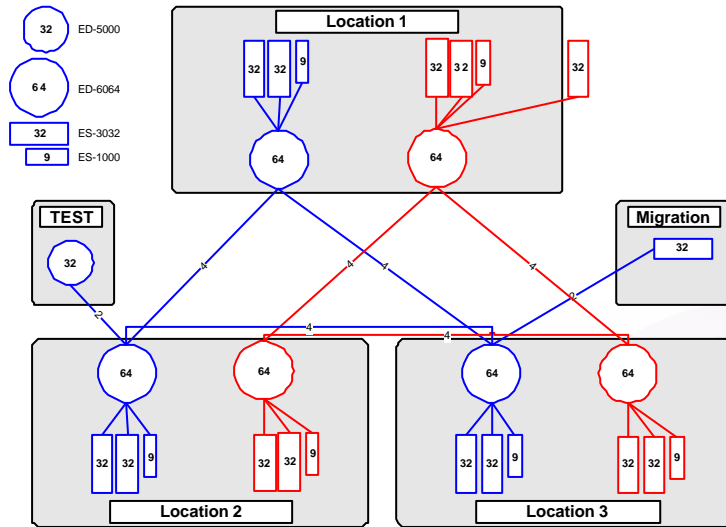- **Amount of Data**
  - Capacity needs
  - Management

Case study 1

Theory ...

Practice in 2001

Concept Finance „Production" 2002

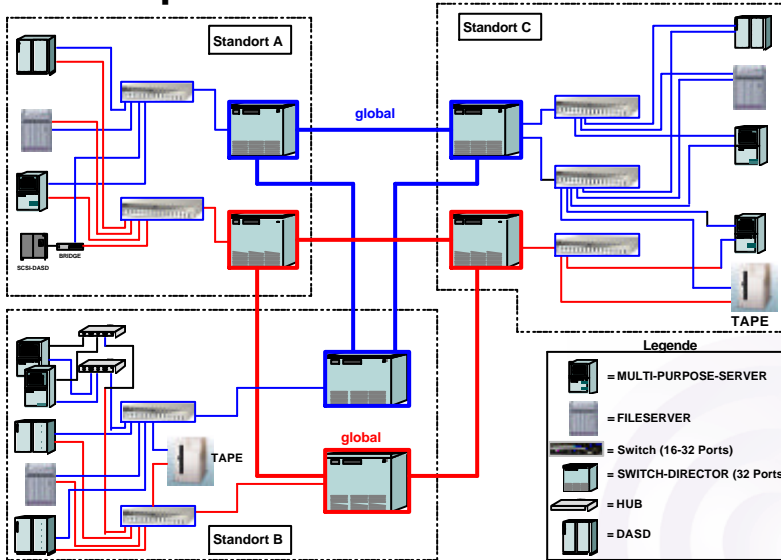Concept Finance „SAP" 2001
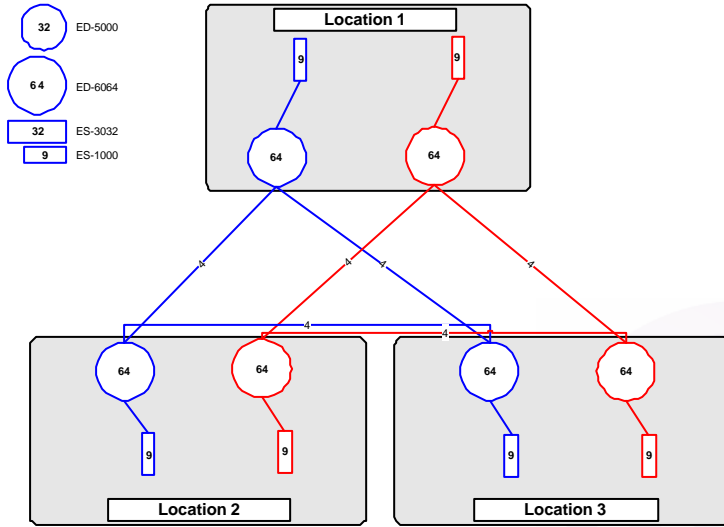
Concept Finance „Production" 2002
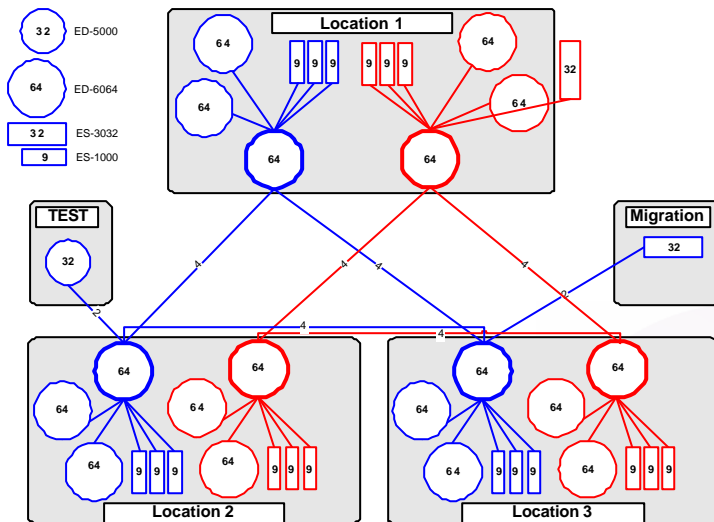
Case study 2

Concept Finance in Germany (1)

- **2 Layer principle**
  - Concept of 2 independent SANs
  - Each across multiple locations
  - Global switches
    - *Backbone Switch on each location*
    - *Connection to other locations (ISLs)*
  - Local switches
    - *Consolidation Switches*
    - *Connection only to the backbone (ISLs)*

- **3 Classes of ports**
  - High end – direct on global switches (ED-5000)
  - Midclass 1 – direct on local switches (ES-3016)
  - Midclass 2 – FCAL (ES-1000 at global switches)

Blueprint

Standort A

Standort C

global

SCSI-DASD

BRIDGE

TAPE

TAPE

global

Standort B

Legende

= MULTI-PURPOSE-SERVER

= FILESERVER

= Switch (16-32 Ports)

= SWITCH-DIRECTOR (32 Ports)

= HUB

= DASD

Concept Finance (1)

1. Location

3. Location

2. Location

SAN A = 10 Switches

global Backbone A

local Switches A

SAN B = 9 Switches

global Backbone B

local Switches B

Concept Finance (1)

1. Location

3. Location

2. Location

SAN A = 7 Switches

global Backbone A

local Switches A

SAN B = 6 Switches

global Backbone B

local Switches B
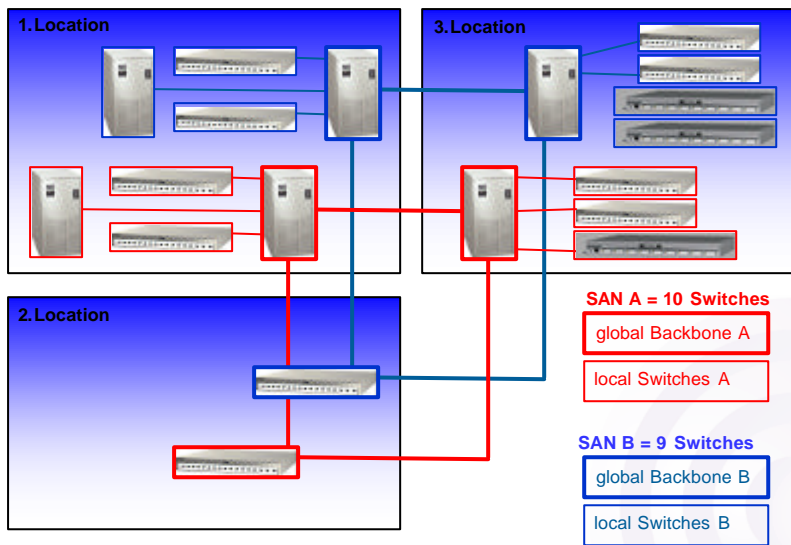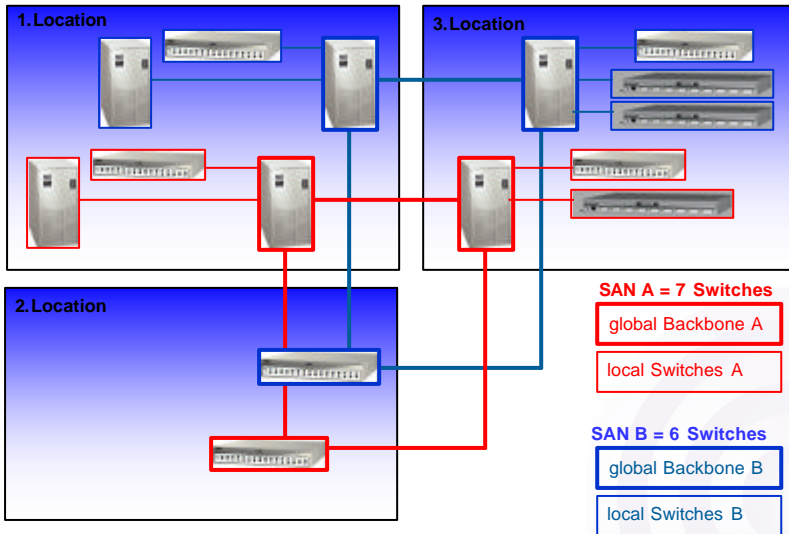
Avoid the Island impact in your SAN and
you will find some time to think
about important issues …