

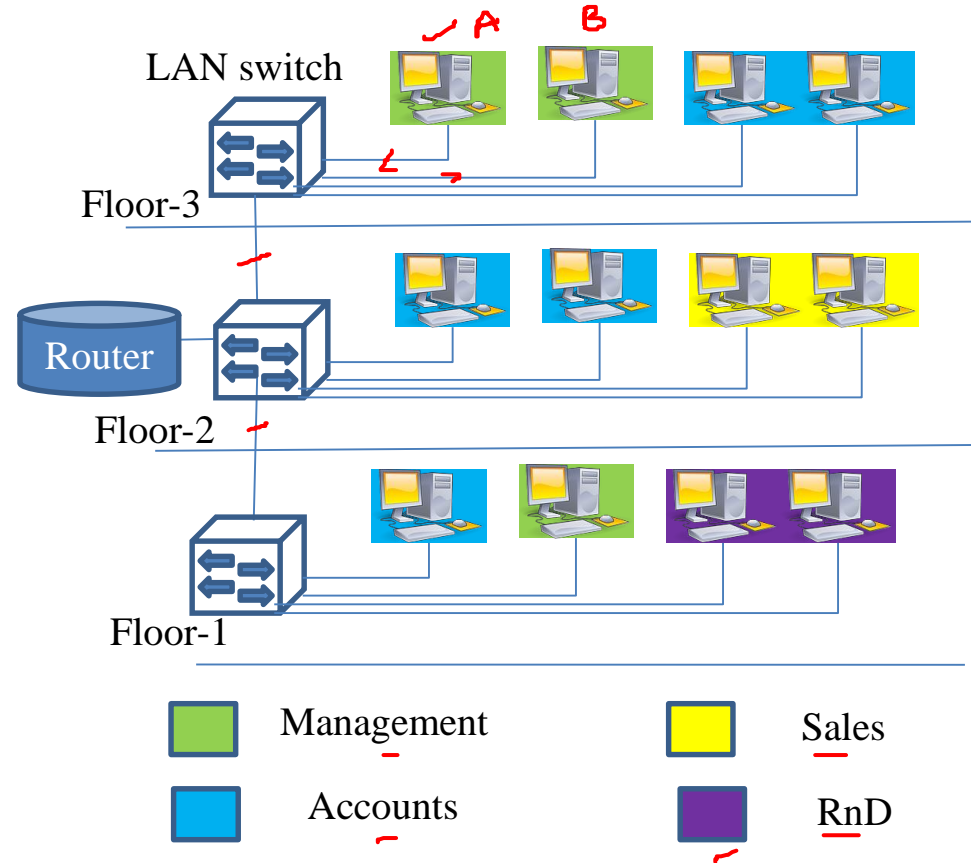
# Virtual LANs

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# Typical Configuration

## Issue-1:

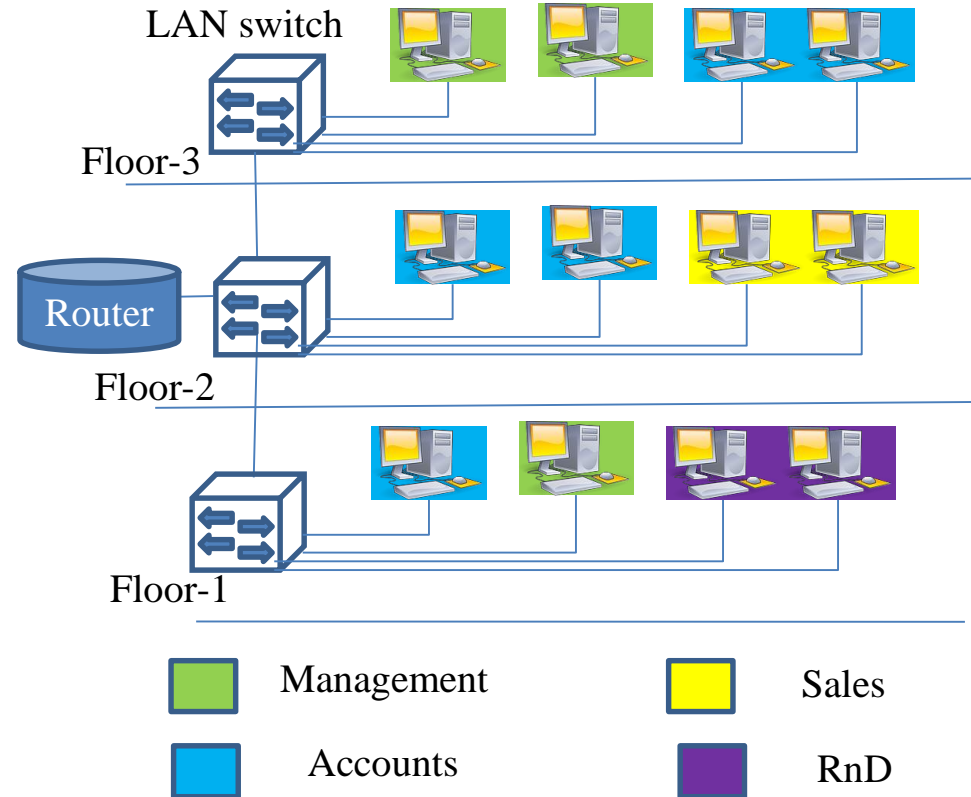
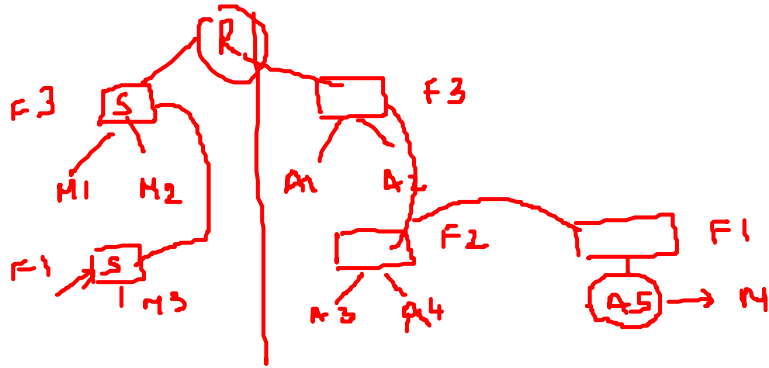
- Lack of Traffic Isolation:  
Broadcast traffic traverses the entire extended LAN
  - Performance issues:  
Broadcast traffic eats into bandwidth
  - Security concerns:  
Management traffic should not be received by any others



# Modified Configuration

Solution:

- For a given floor, connect each group to a switch and inter connect the switches via a router



# Modified Configuration

More Issues:

□  
few users

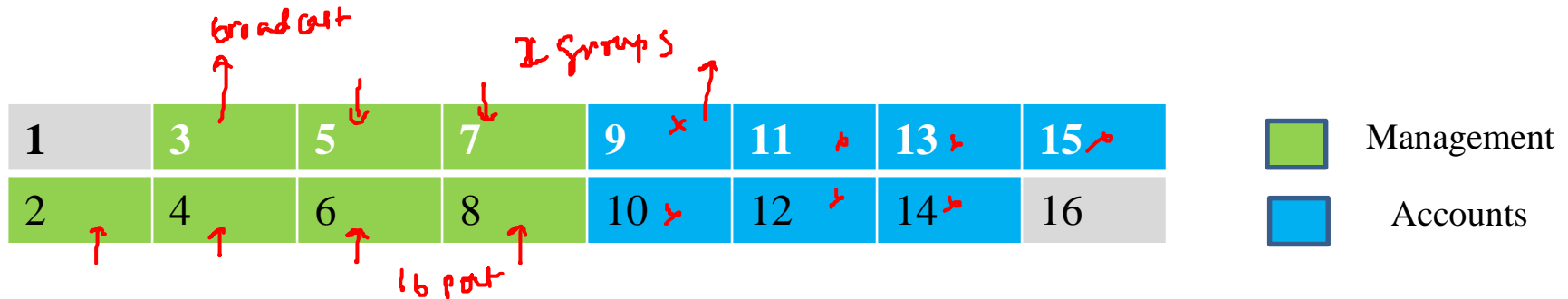
- Increases Cost:
  - Inefficient use of switch ports; too many switches and a router
- User Management:
  - An employee moves between groups, physical cabling has to be changed

# Virtual Local Area Networks (VLANs)

- Partition the extended LAN into several seemingly separate LANs
  - Impose logical topology in software without rewiring
- VLANs can be defined in several ways
  - Port based VLANs
  - MAC address based VLAN
  - Network Protocol based VLAN

# Port based VLAN

- Ports of a switch are divided into groups (colors)
- Each group constitutes a VLAN
- VLAN switch ensures that broadcast traffic from one group does not reach other group





- Traffic Isolation ✓

- Cost ✓ (One switch suffices)

- User Management ✓

- Reconfigure the VLAN software so that the port reflects the right color

1	3	5	7	9	11	13	15
2	4	6	8	10	12	14	16

 Management  
 Accounts

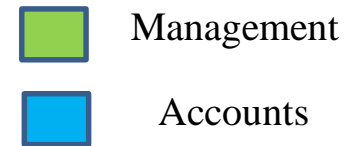
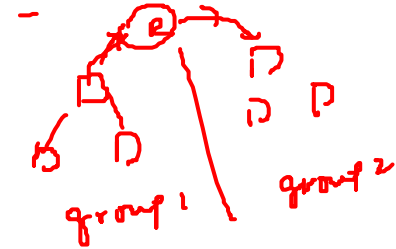
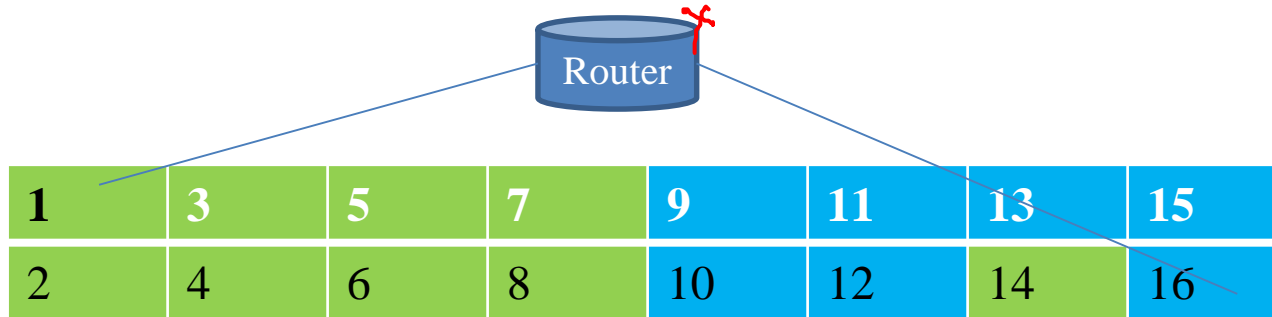
V3 → V13  
unit

→ ?

blue

# Issue of Forwarding

- How to route traffic from Management to Accounts?  
(they are completely isolated)
- Connect via a router (just as with separate switches
  - Vendors of VLAN switches often include the router functionality (no need for external router)





# Issue of Interconnecting Switches

1	3	5	7	9	11	13	15
2	4	6	8	10	12	14	16

S 1

N VLANs  
each switch

1	3	5	7	9	11	13	15
2	4	6	8	10	12	14	16

S 2

?  
2 switch

1	3	5	7	9	11	13	15
2	4	6	8	10	12	14	16



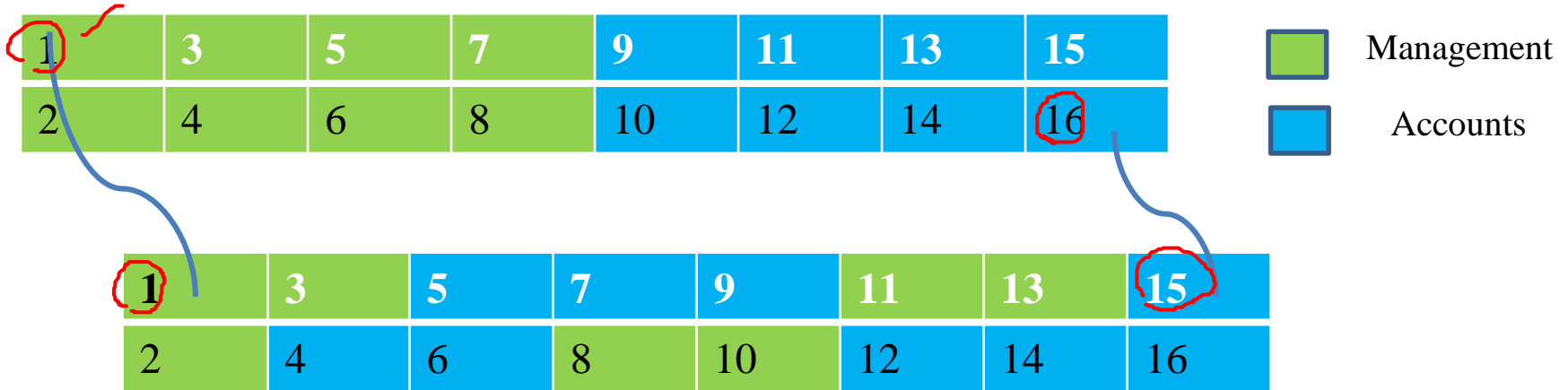
Management



Accounts

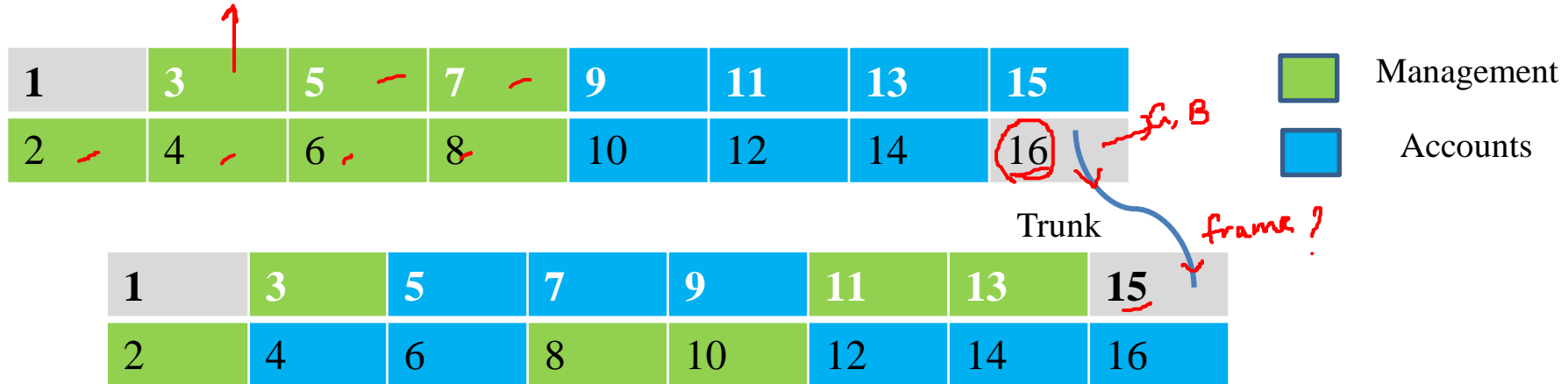
1	3	5	7	9	11	13	15
2	4	6	8	10	12	14	16

- Solution not scalable
  - N VLANs require N ports on each switch



# VLAN Trunking

- A special port on each switch configured as Trunk port
  - Trunk port belongs to all VLANs (assigned all VLAN colors)
  - Frames sent to any VLAN are forwarded over trunk port and reach the other switch



# Issue for Frame Identification

- Which VLAN does the received frame on trunk port belong to?  
*frame → identify VLAN*
- Need an extended Ethernet frame format that carries the identity of the VLAN
- Defined by 802.1Q protocol
  - A 4-byte VLAN tag added into the header by the sender switch and removed by the receiver switch
  - Transparent to clients

# Summary

- Extended LANs suffer from traffic isolation problem
- VLANs are an interesting concept that partition an extended LAN into several virtual LANs
- Port-based VLANs assign colors to ports to aid frame forwarding
- VLAN trunking helps interconnect switches in a scalable fashion