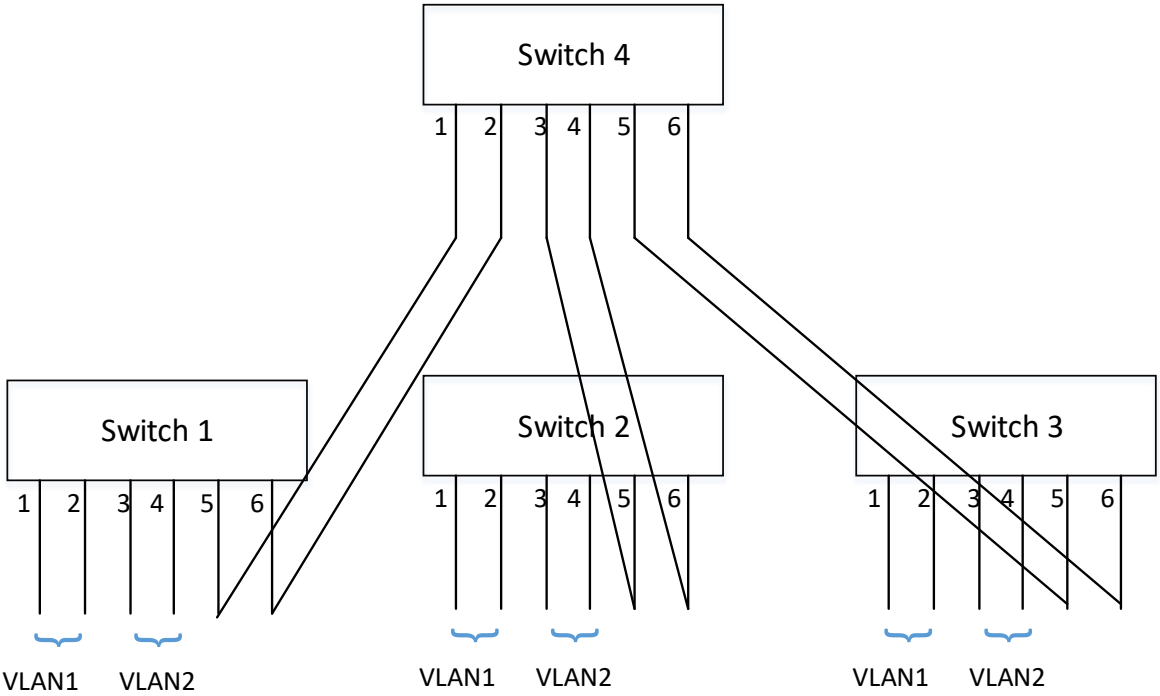
City University of Hong Kong
Department of Electrical Engineering

EE3009 Data Communications and Networking

Solution to Assignment 2

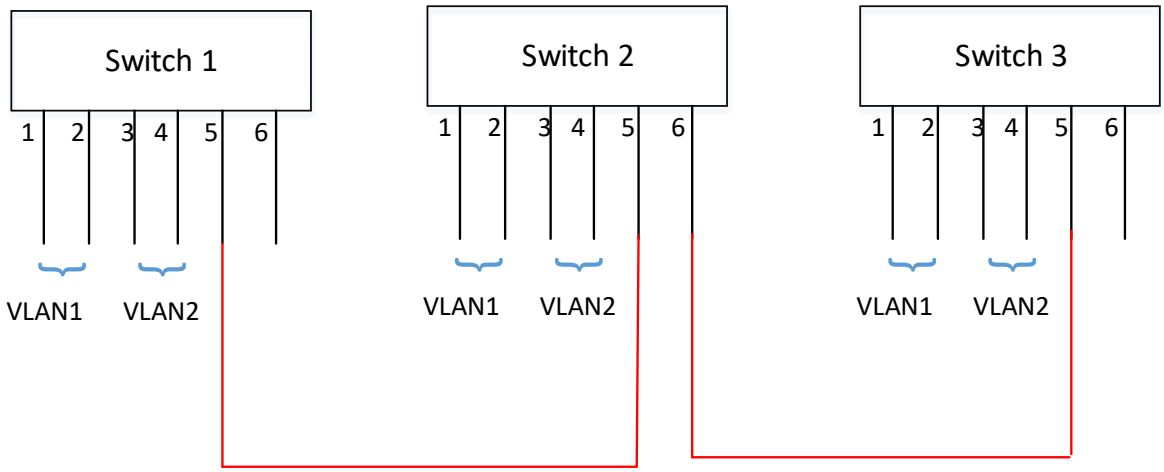
1. There will be a collision, because while a node is still transmitting, the bits of the packet from the other node has already arrived.

2.
   a. When port-based VLAN is used, the switches are connected as follows:



switch 1, port 5 -> VLAN1
switch 1, port 6 -> VLAN2
switch 2, port 5 -> VLAN1
switch 2, port 6 -> VLAN2
switch 3, port 5 -> VLAN1
switch 3, port 6 -> VLAN2
switch 4, port 1, port 3, port 5 -> VLAN1
switch 4, port 2, port 4, port 6 -> VLAN 2

b. With VLAN trunking, switch 4 is not needed, and the switches are connected as follows:



Switch 1, port 5 -> trunk port
Switch 3, port 5 -> trunk port
Switch 2, port 5 and port 6 -> trunk port

3. To maximize the successful transmission rate is to maximize the probability of successful transmission.

Pr(success) = number of stations × Pr(one station transmits on one bus and at the next slot)
×Pr(no other stations transmit on the same bus at the next slot)

$= 4(\frac{1}{2}p)(1-\frac{1}{2}p)^3 = 2p(1-\frac{1}{2}p)^3$

Take the derivative of p ,

$\frac{d}{dp}$Pr(success) = $2(1-\frac{1}{2}p)^3 - 3p(1-\frac{1}{2}p)^2$

set it to 0 => $(1-\frac{1}{2}p)^2(2-4p) = 0$

$p=1/2$.

4. The transmission activity of each station is shown below.