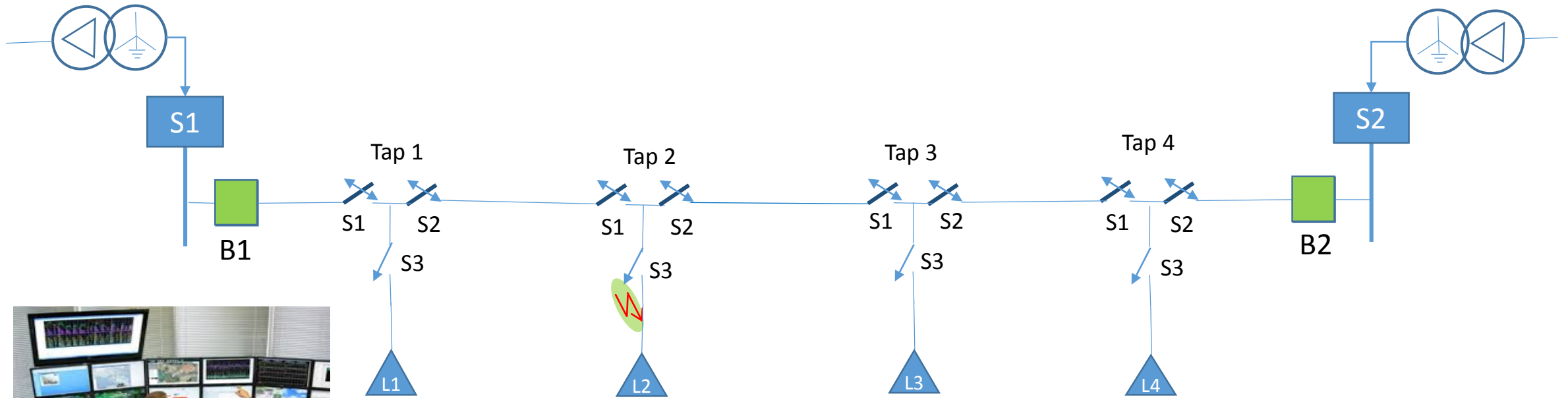


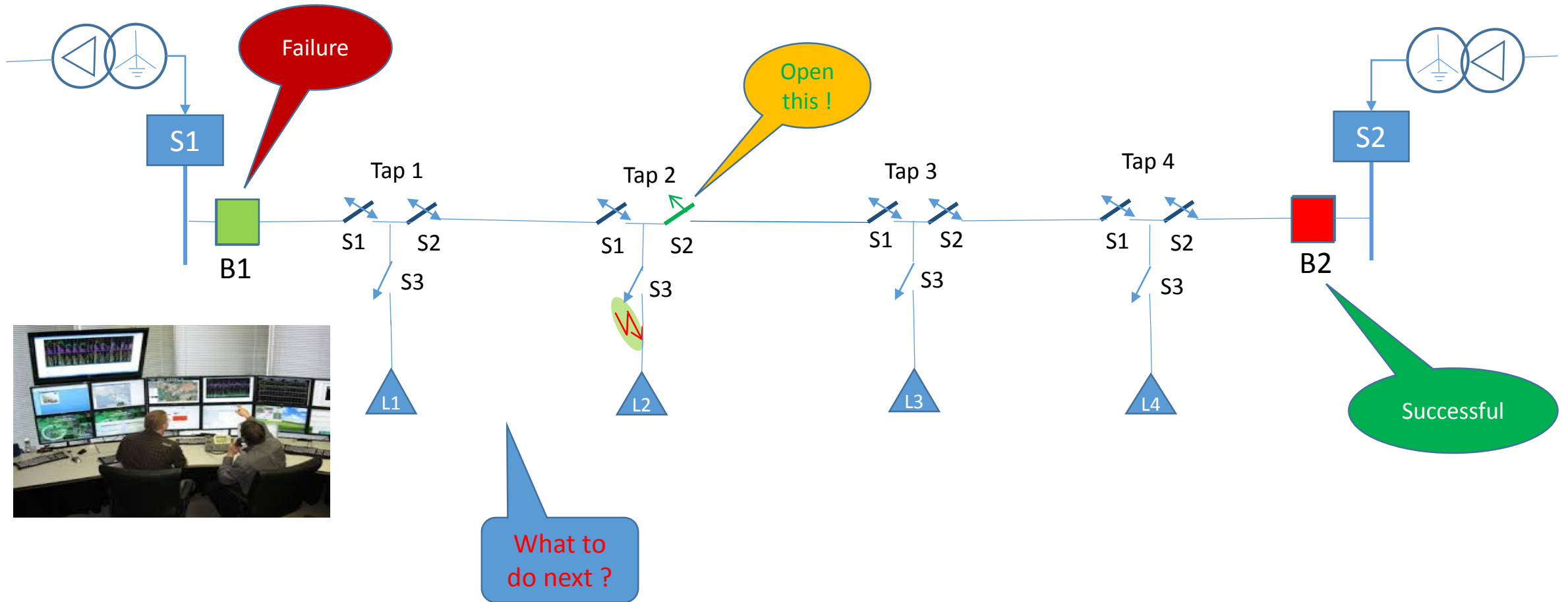
Southern States LLC

Intelligent Circuit Sensor enabled Fault Detection, Isolation and Restoration for Transmission Lines with T-connection Taps

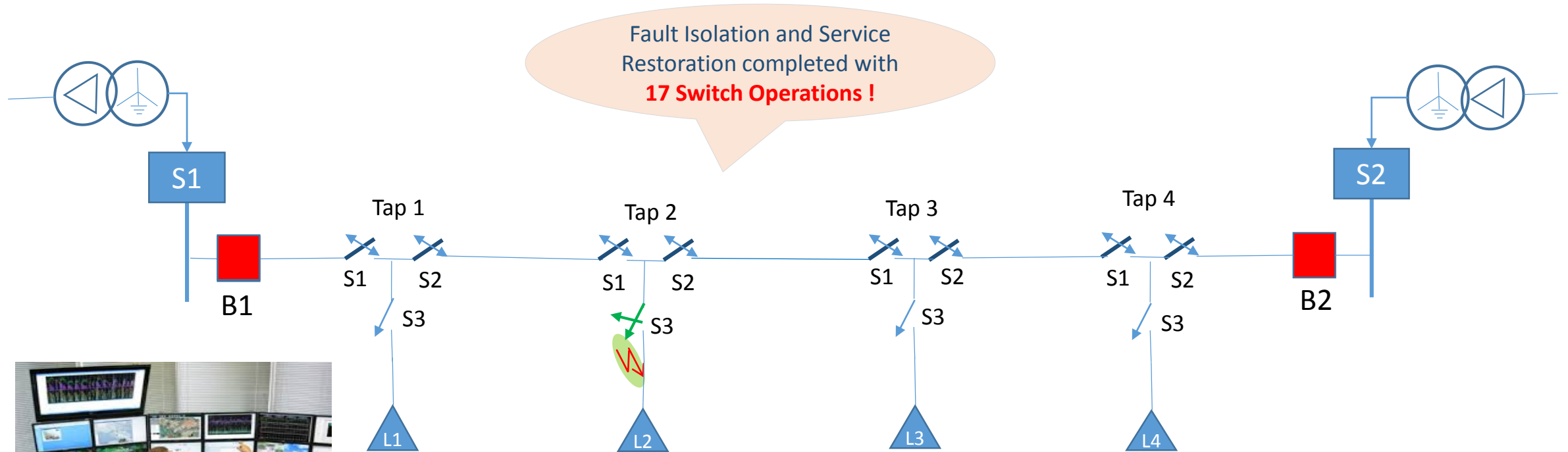
Tapped Transmission Line: Manual "Hunting"



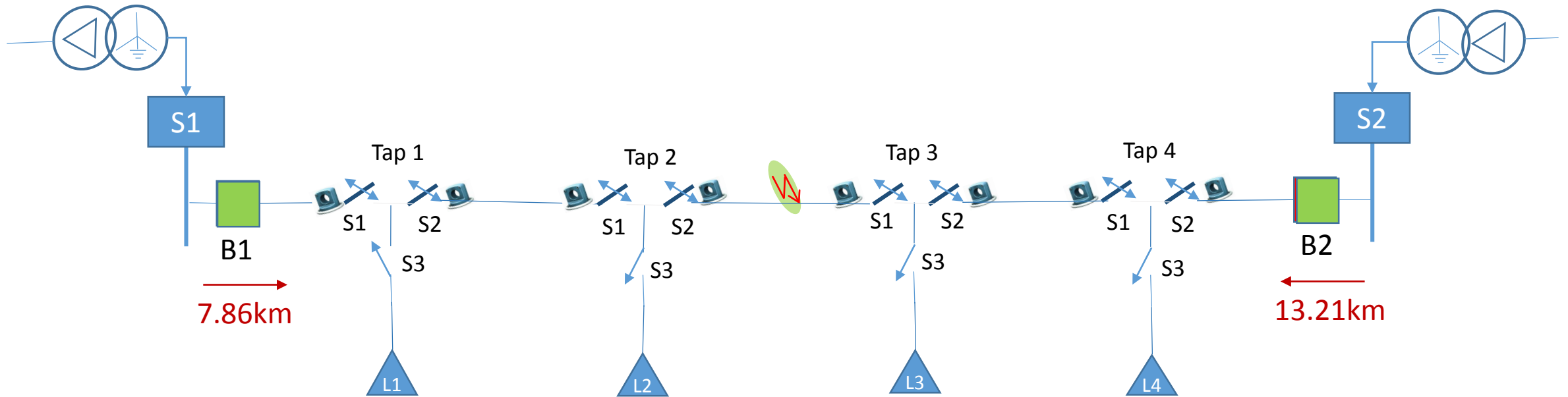
Tapped Transmission Line: Manual "Hunting"



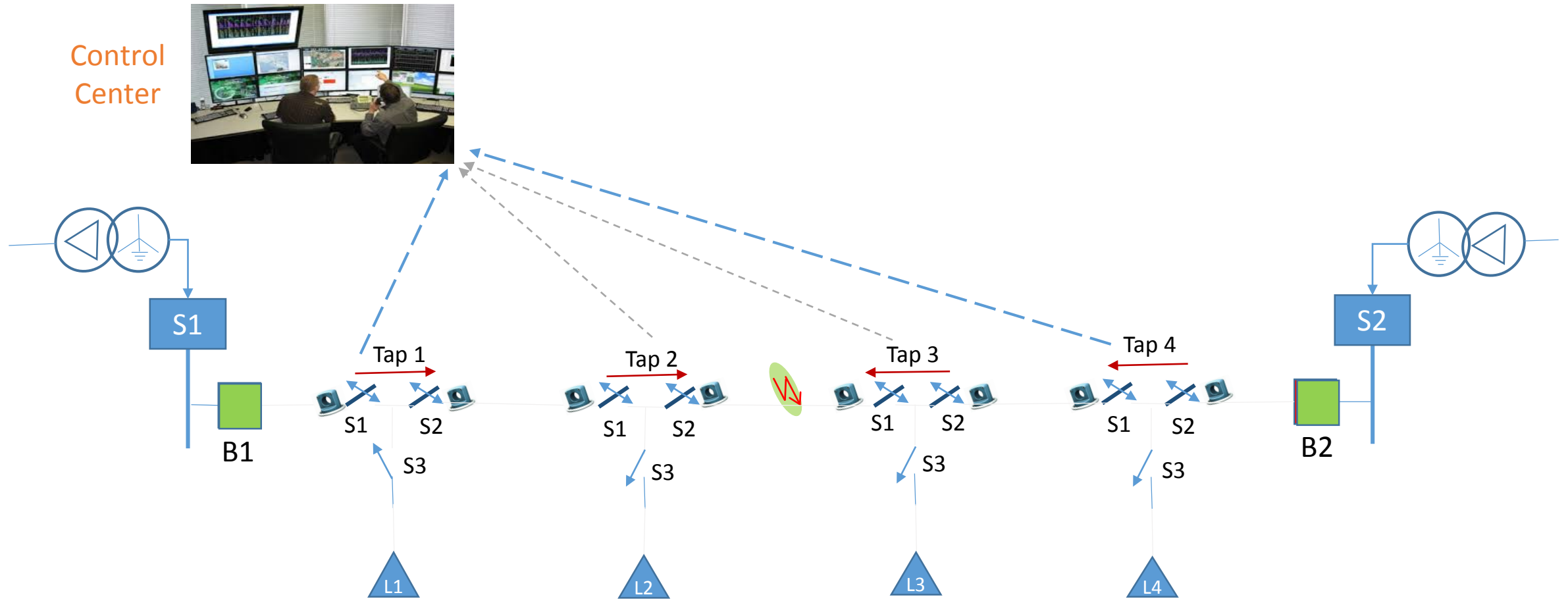
Tapped Transmission Line: Manual "Hunting"



Tapped Transmission Line: Distance Protection



Tapped Transmission Line: Centralized Intelligence



Existing Solutions' Challenges

- Manual “Hunting”
 - Requires communications
 - Human in the loop
 - # of switch operations
 - Stress on equipment/assets
- Distance Protection
 - Requires communications
 - Multiple possible fault locations
 - Coordination after system reconfiguration
- Centralized
 - Requires communications
 - Line and topology modeling

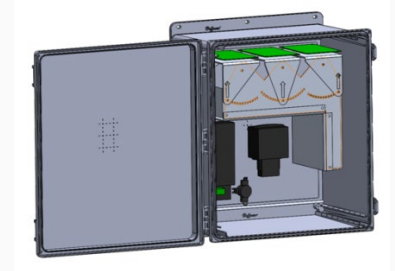
Smart Tap[®] enabled Transmission FDIR

Operation Rules:

- ❑ T-FDIR starts after instantaneous reclose fails (permanent fault)
- ❑ When a Smart Tap detects a fault, it determines the fault direction and the faulted zone in one of the 3 zones:
 - Zone 1:** Fault is “DEFINITELY” in one of its immediately connected sections or lateral line:
 - Action – Select switch in Direction of Fault, Open and lock out switch connecting faulted section after instantaneous reclosing fails
 - Zone 2:** Fault is “POSSIBLY” in one of its immediately connected sections:
 - Action 1 – Flag for opening switches connecting possibly faulted section
 - Action 2 – Open and lock out switch connecting faulted section when next reclose fails
 - Zone 3:** The fault is “NOT” in any of its immediate sections or the lateral line:
 - Action – No action taken, switch stays closed
- ❑ T-FDIR completes fault isolation and restoration prior to 2nd reclose (80% probability)
- ❑ T-FDIR completes fault isolation and restoration prior to 3rd reclose (100% probability)



Sensors

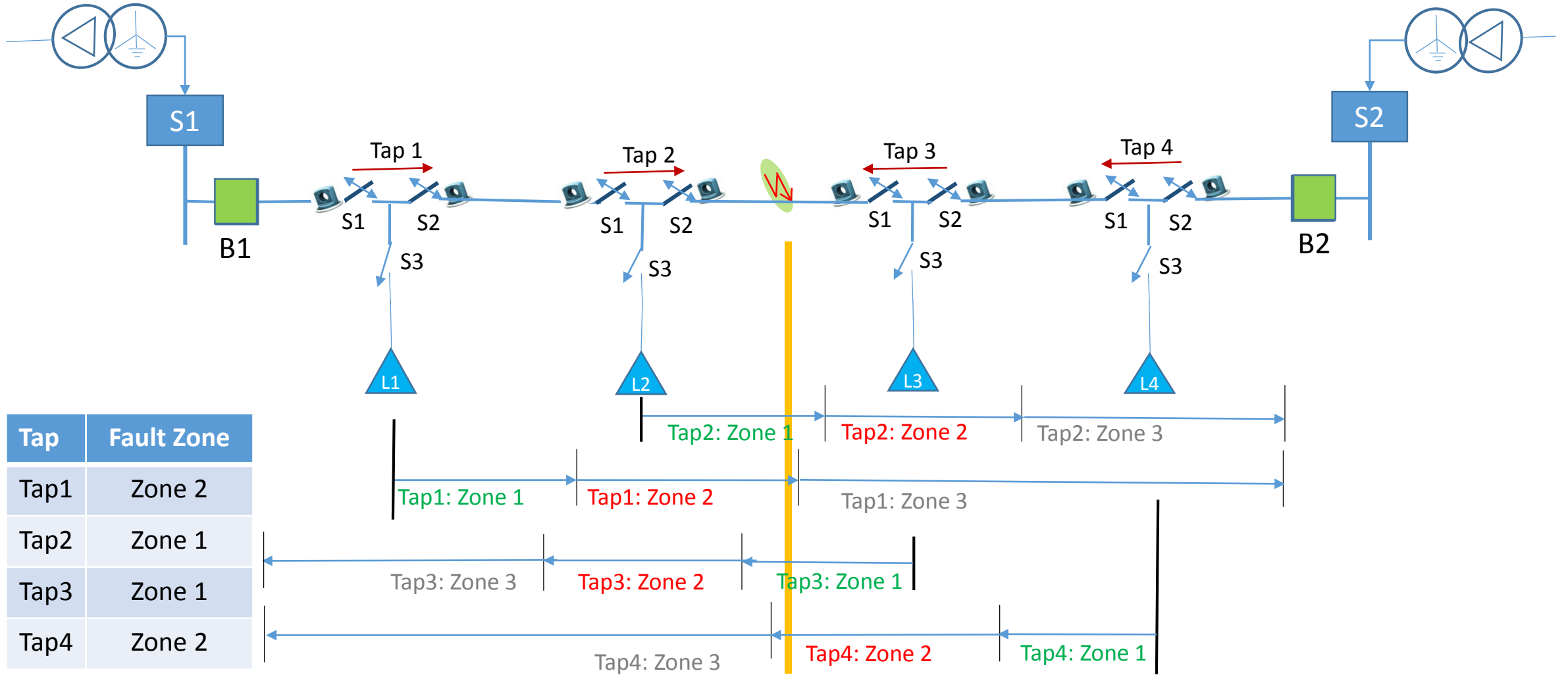


Receiver

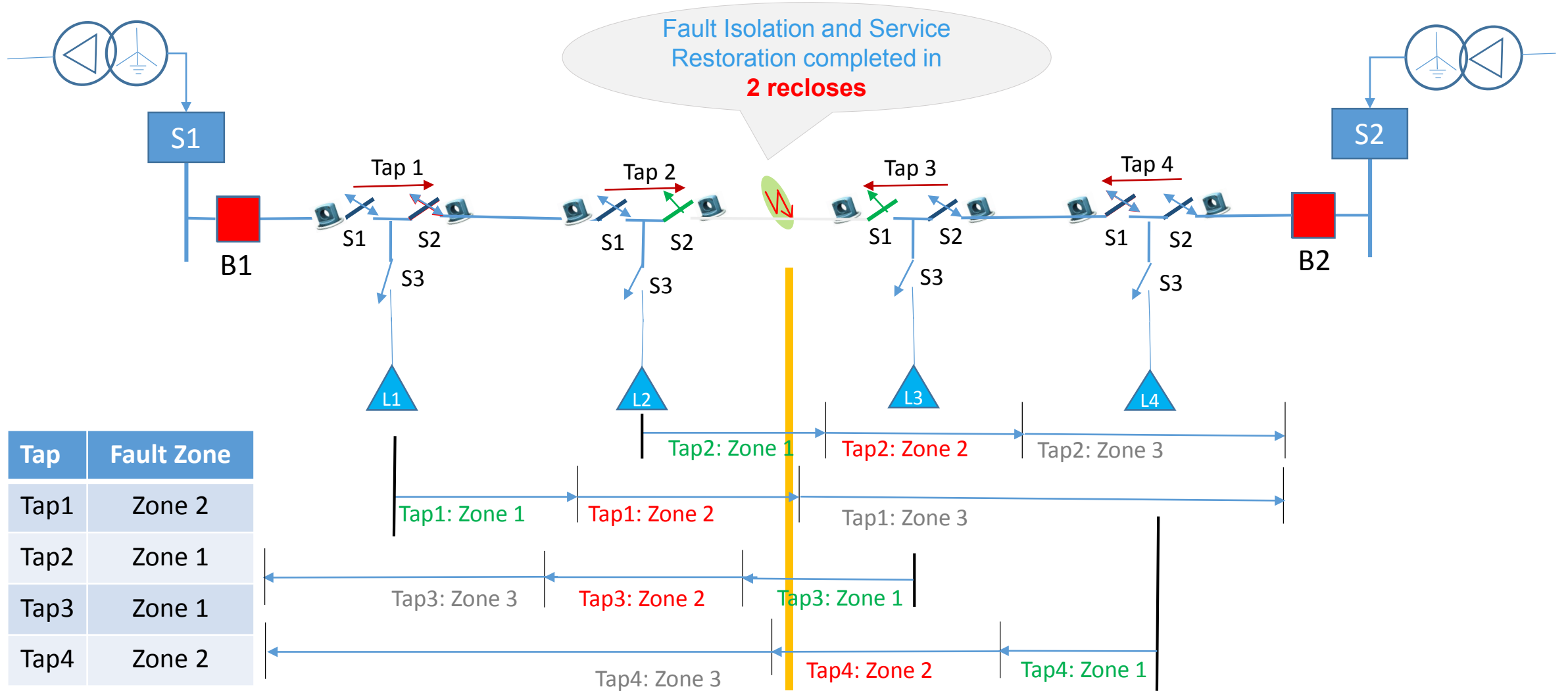


Controller

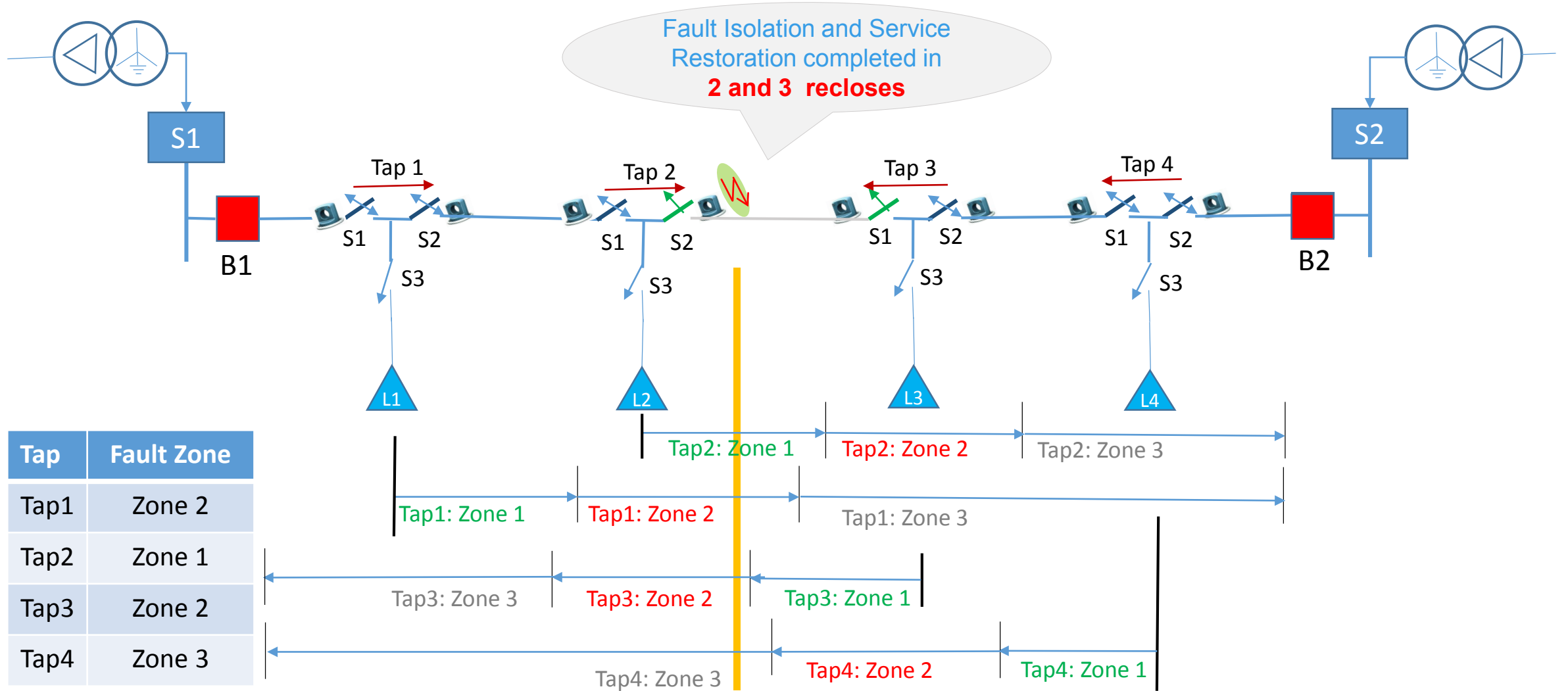
Smart Tap[®] enabled T-FDIR (fault example 1)



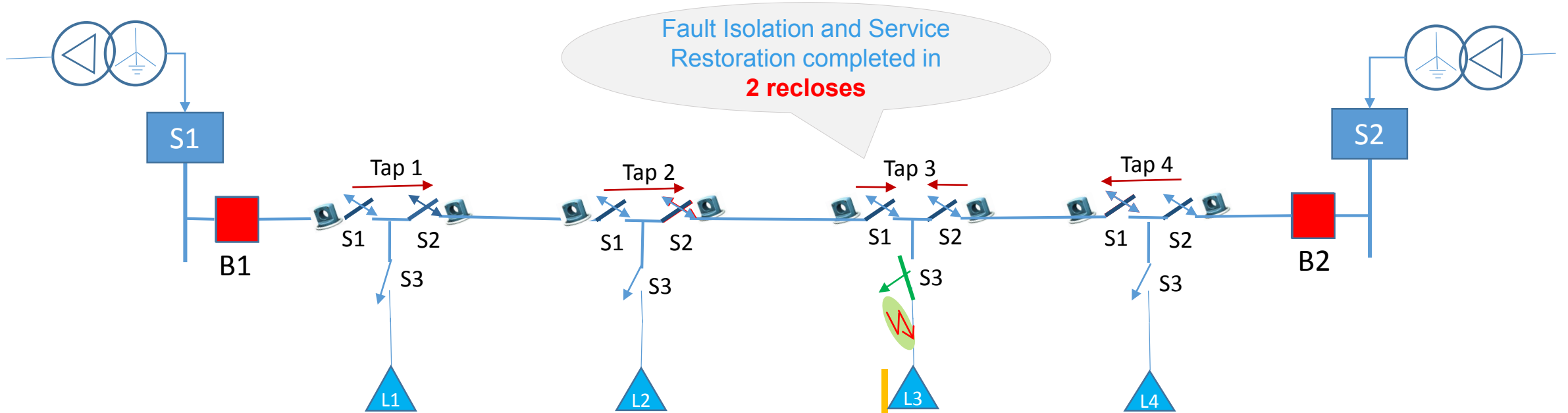
Smart Tap[®] enabled T-FDIR (fault example 1)



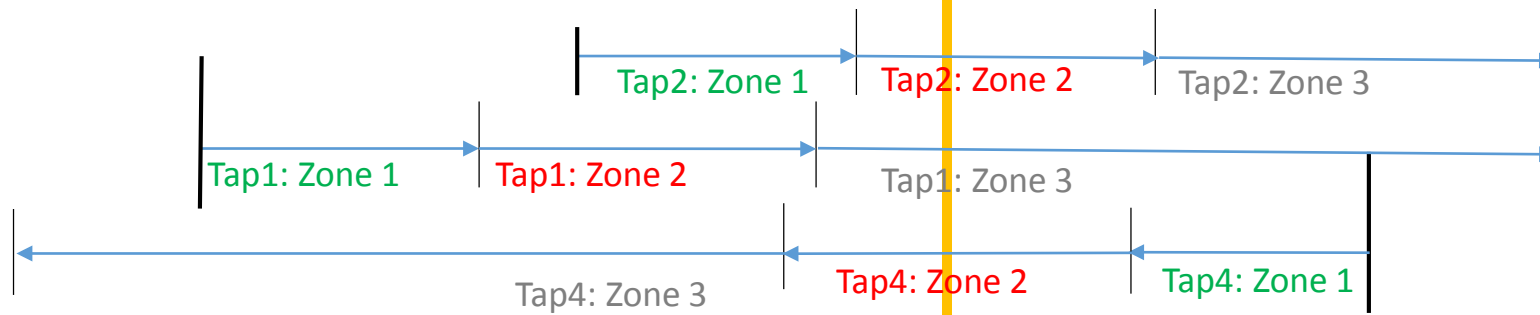
Smart Tap[®] enabled T-FDIR (fault example 2)



Smart Tap[®] enabled T-FDIR (fault example 3)



Tap	Fault Zone
Tap1	Zone 3
Tap2	Zone 2
Tap3	Zone 1
Tap4	Zone 2

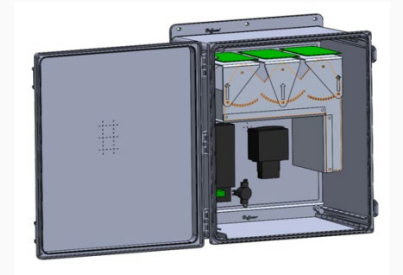


Smart Tap[®] enabled T-FDIR Summary

- Isolation and Restoration within breaker reclose cycles
- No operator action needed
- No reliance on communications
- Minimal switching actions
- Low stress on assets/equipment
- Zero to minimal reconfiguration if topology changes



Sensors



Receiver



Controller

Thank You!

Questions?