

Packet synchronization deployment and challenges to mobile operator



Background

Challenges

1. Network growth seek the transformation of services delivery mechanism.
2. Summary of previous setup:

DESCRIPTION	CURRENT TECHNOLOGY	FUTURE TECHNOLOGY
Backbone	Fiber optic infrastructure based on DWDM and IP MPLS network	Fiber optic infrastructure based on DWDM and IP MPLS network
Aggregator	Majority serve with SDH microwave and minority serve with fiber optic infrastructure (SDH) & TDM bandwidth leasing from 3 rd party services provider	Majority serve with fiber optic infrastructure (Packet Transport) & Ethernet bandwidth leasing from 3 rd party services provider and minority serve with packet microwave
Last mile	Majority serve with PDH microwave and minority serve with fiber optic infrastructure (SDH) & TDM bandwidth leasing from 3 rd party services provider	Mixture serve with packet microwave, fiber optic infrastructure (packet Transport) & Ethernet bandwidth leasing from 3 rd party services provider
RAN solution	2G, 3G – ATM	2G, 3G – ATM , 3G- Hybrid (ATM & IP, 3G IP & LTE

Existing Transmission Architecture

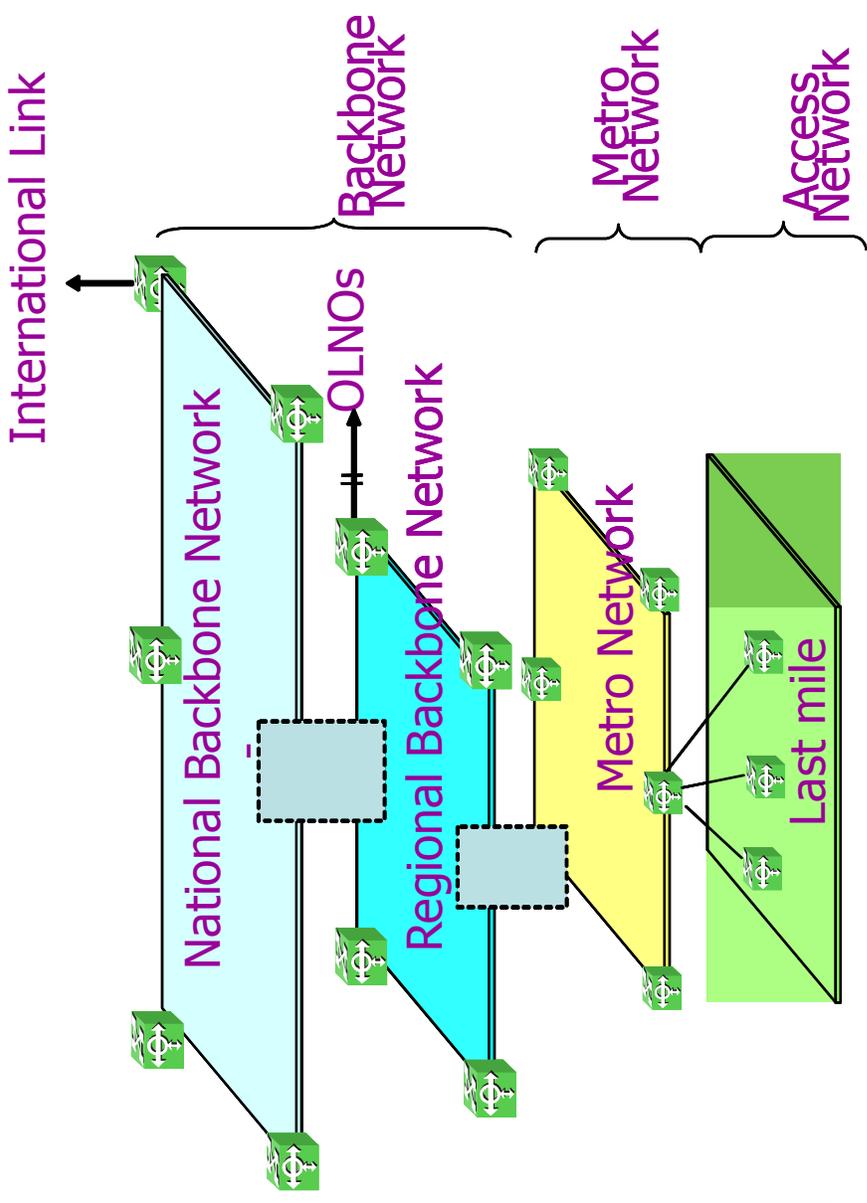
Technology

DWDM , ASON,

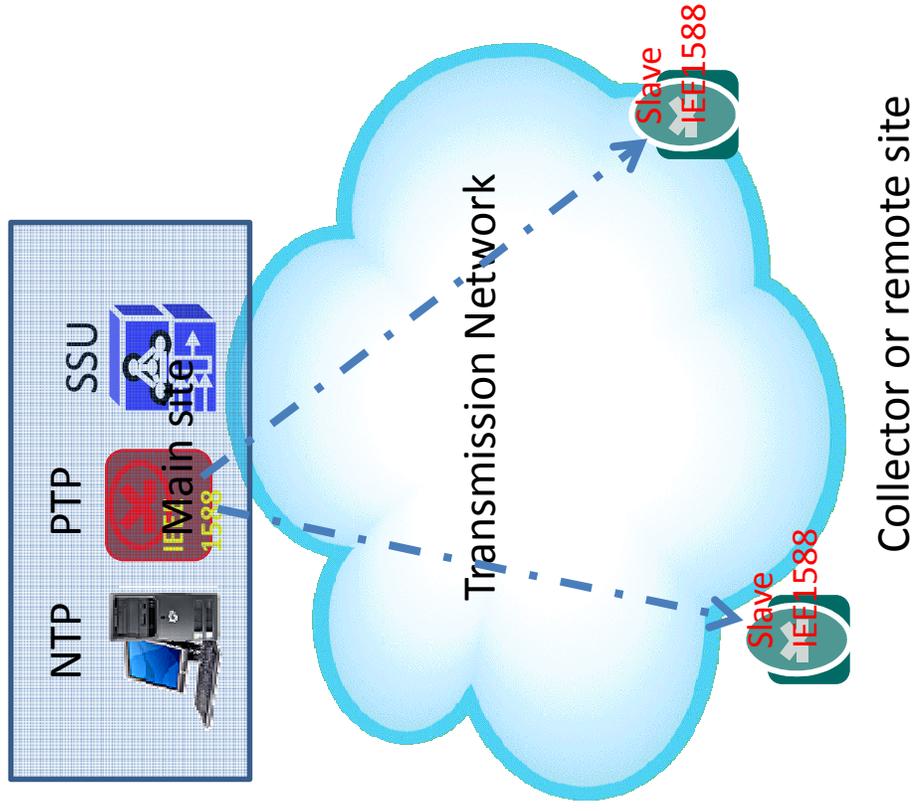
DWDM , ASON,

SDH, PDH, EoSDH,
Ethernet Leasing

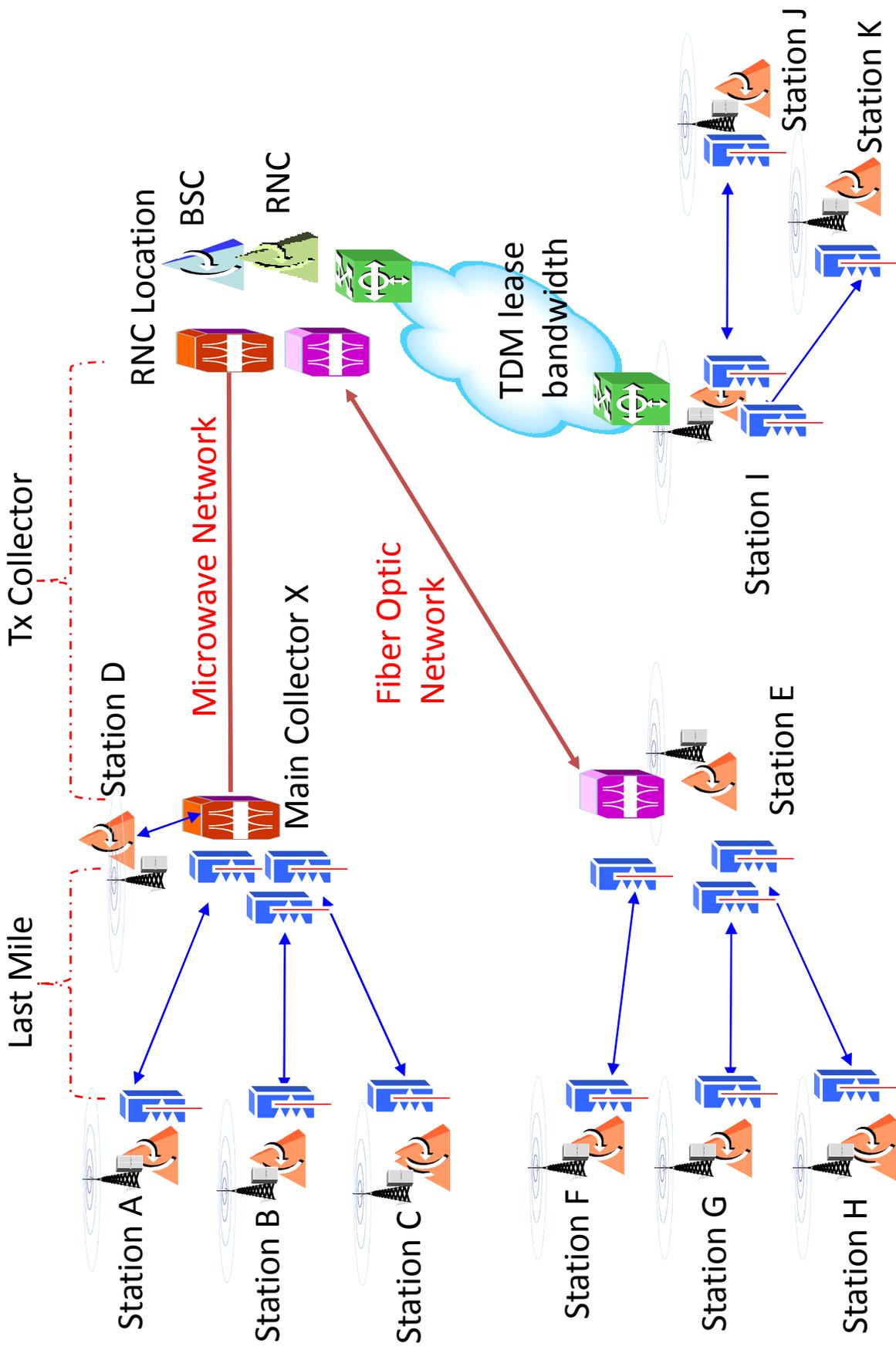
SDH, PDH, EoPDH



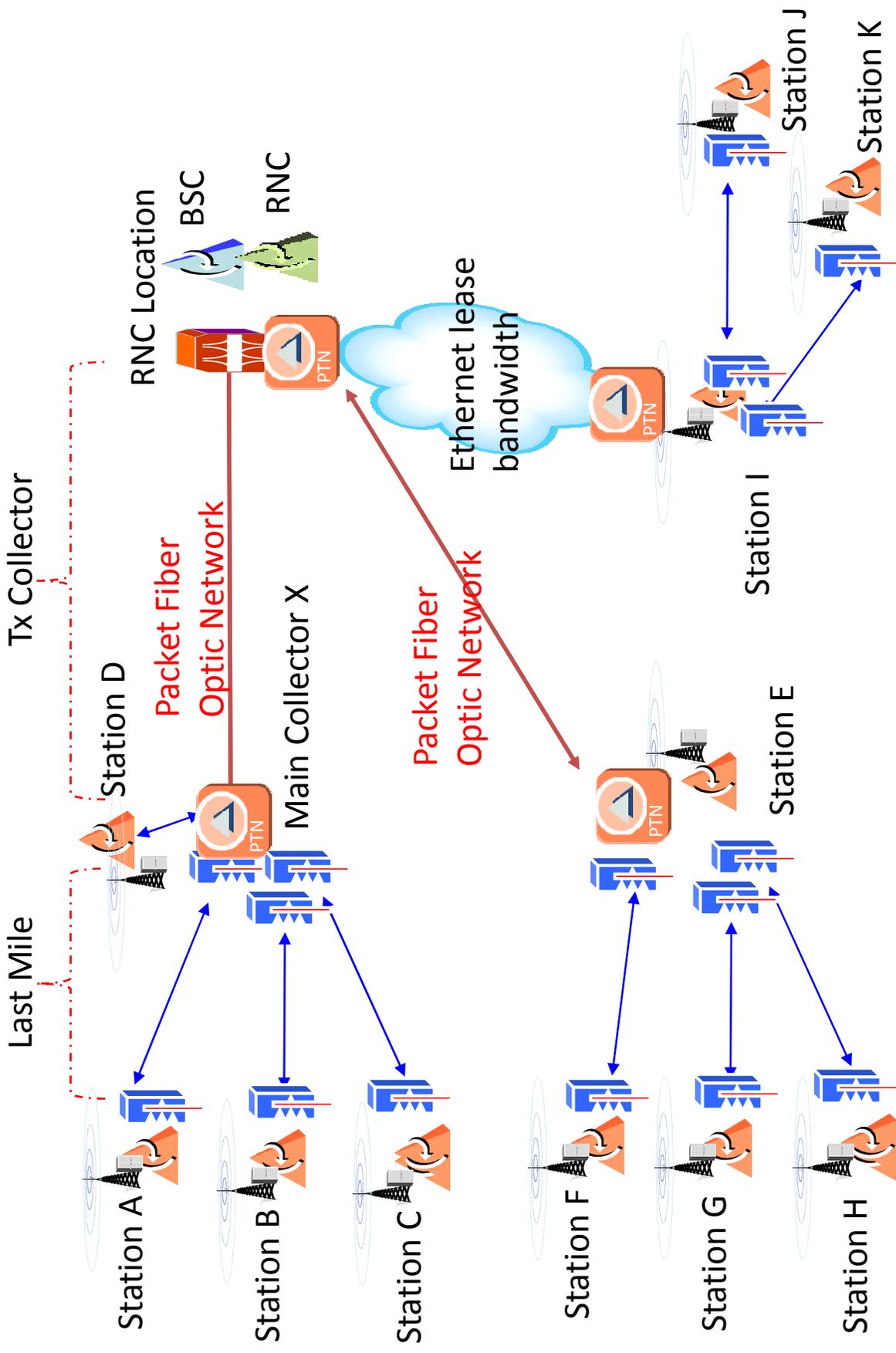
Current Synchronization Architecture



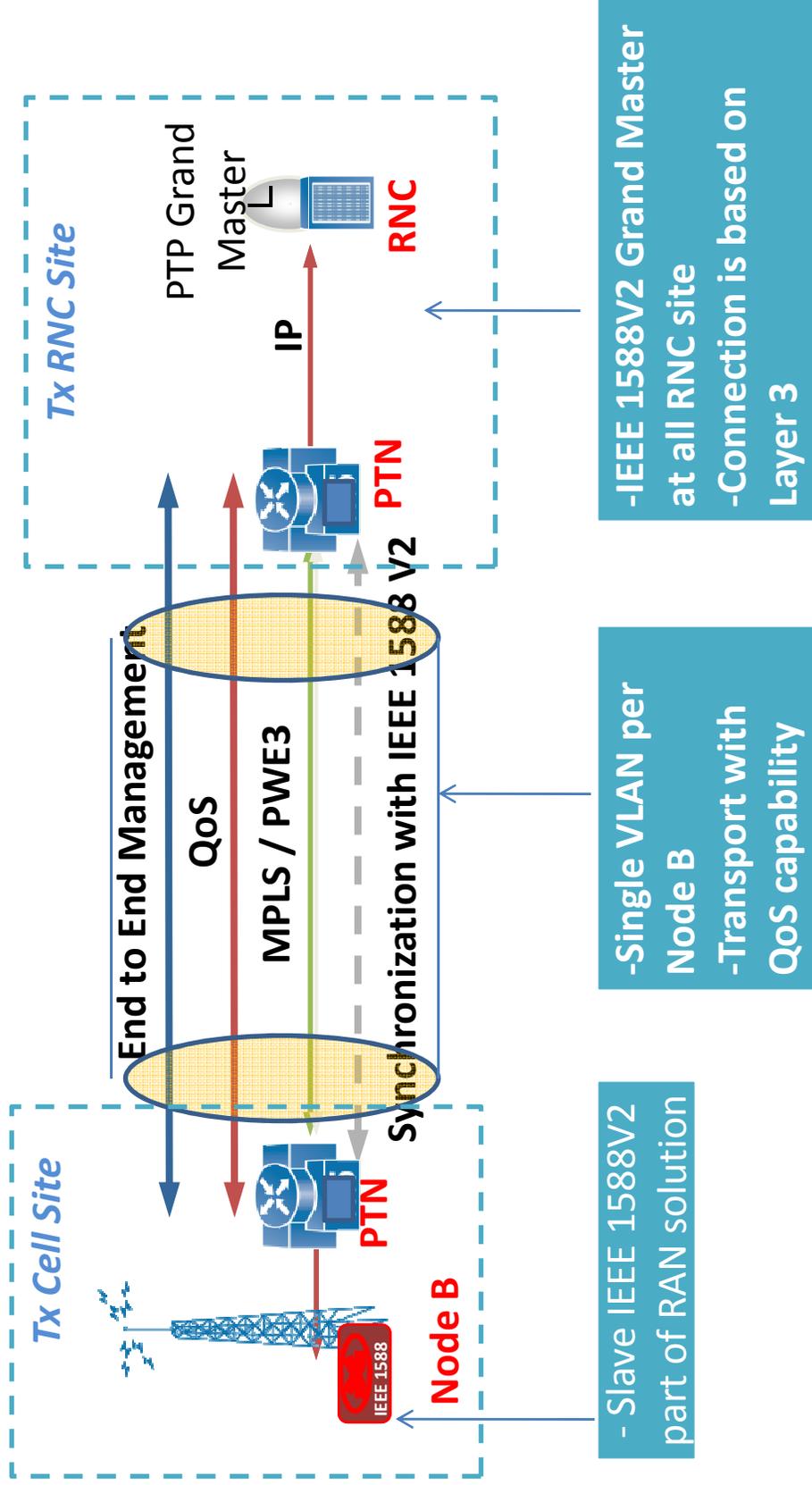
Current Access Network Overview



Target Access Network Overview



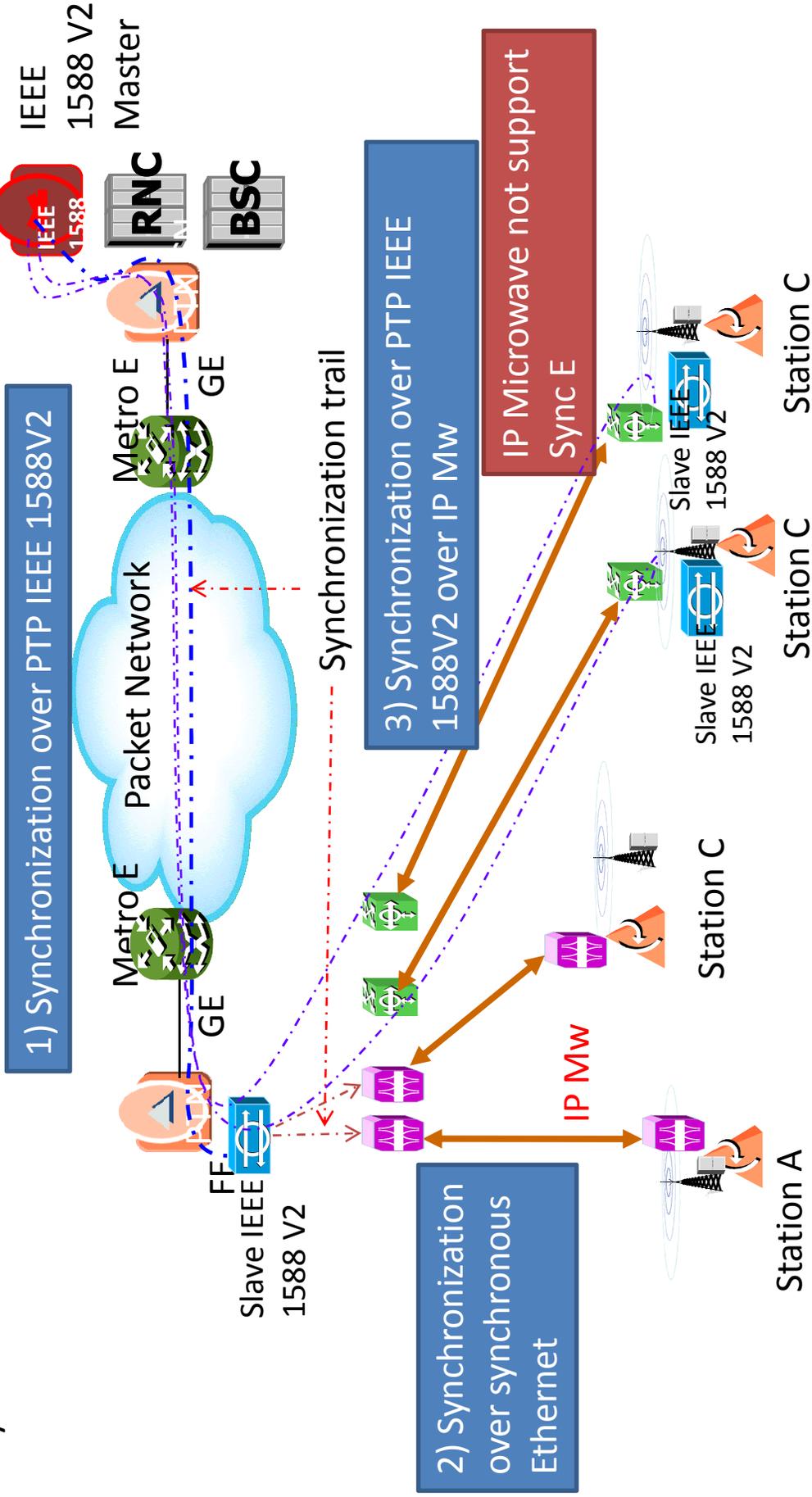
Packet Synchronization Implementation Strategy



Overview Packet Synchronization Strategy



The propose packet synchronization with combination of PTP IEEE 1588 V2 and synchronous Ethernet





Challenges

Listed below are the pain points and challenges for synchronization network and packet based timing network :-

1. Multi transmission medium and technology:
 - a. Radio, fiber optic and bandwidth leasing
 - b. SDH, PDH, EOSSH, Metro E, Packet Transport Network & DWDM
 - c. Multi transport vendor solution
 - d. Multi bandwidth leasing technology
2. Multivendor RAN solution (3 Vendor)
3. Mixture RAN system:
 - a. 2G,
 - b. 3G – ATM , 3G- Hybrid (ATM & IP), 3G IP
 - c. LTE

Challenges

4. The implementation of third parties transmission provider creates difficulty in implement packet synchronization due to:-
 - a. Limited capability to control third parties transmission provider equipment design.
 - b. Control of packet synchronization source
 - c. Old technology



Challenges

5. Unable to monitor end to end synchronization signal performance.
 - a. RAN operator does not equip their system with clock signal performance (only on the status of the clock signal)
6. The stringent synchronization and timing requirement for real time services as proposed by the international standards, requires further study and analysis on how to adapt the new propose standards in the existing network.



Challenges

7. Slave IEEE1588V2 location:-
 - a. Built in RAN solution
 - b. Built in Transport solution
 - c. Stand alone solution



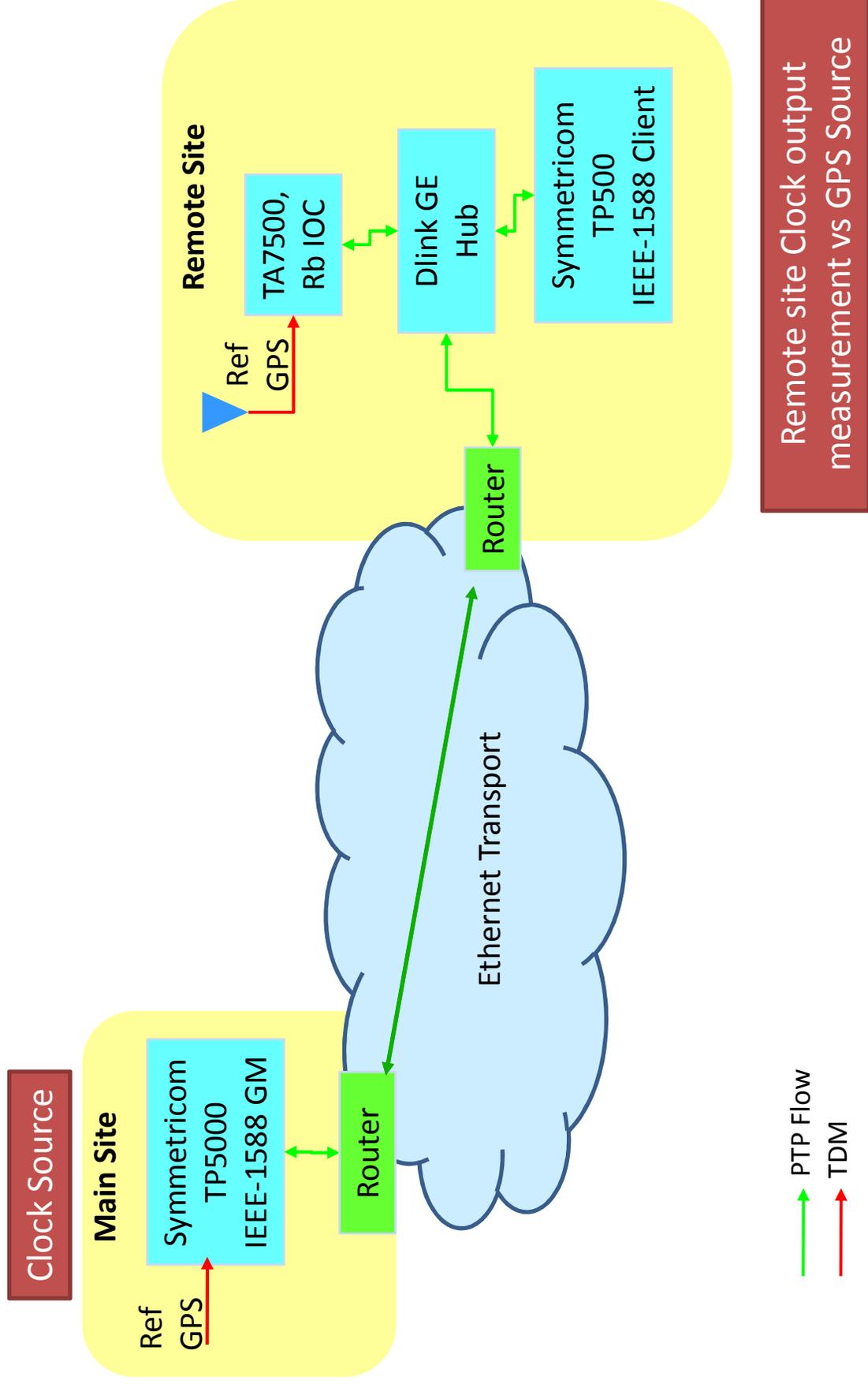
Description	In Band RAN	Stand Alone
Capability to manage synchronization performance by single NMS	Not Support	Support
Capability to connect to two different Grand Master for protection	Support	Support
Simplify operational in view of synchronization performance issue	Not Support	Support
Slave equipment reliability	Depend to RAN supplier	Easy to manage
Cost impact of RAN replacement	Impact	No impact
Interworking issue between Slave to Grand Master	Impact	No impact

Challenges

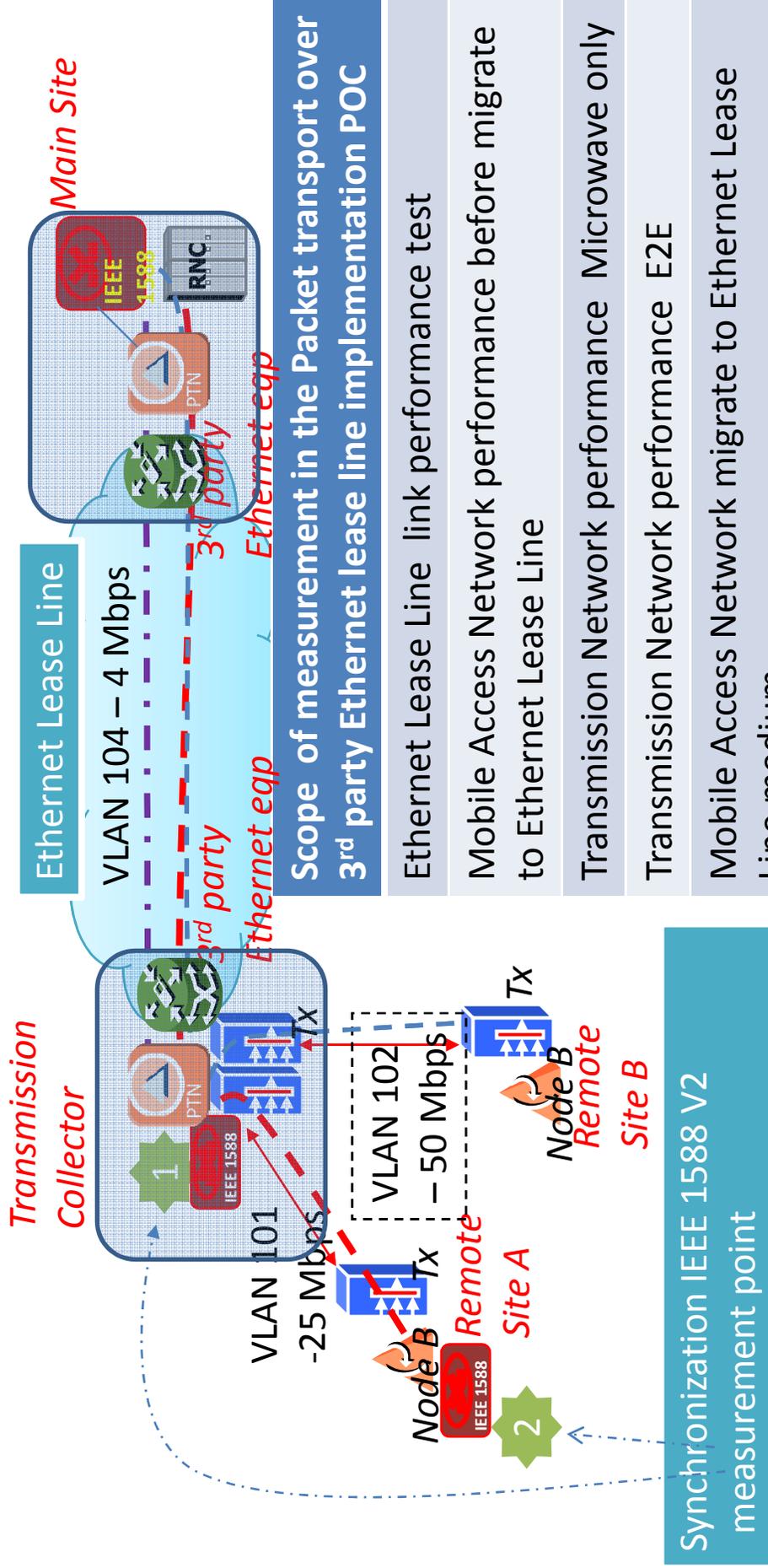
8. Slave IEEE1588V2 improvement reliability requirement:-
 - a. Dual parenting Grandmaster per Slave IEEE1588V2
 - b. Protection of Grandmaster network element
9. Ethernet Transport verification of compliance with IEEE 1588V2.



Proof of concept basic setup



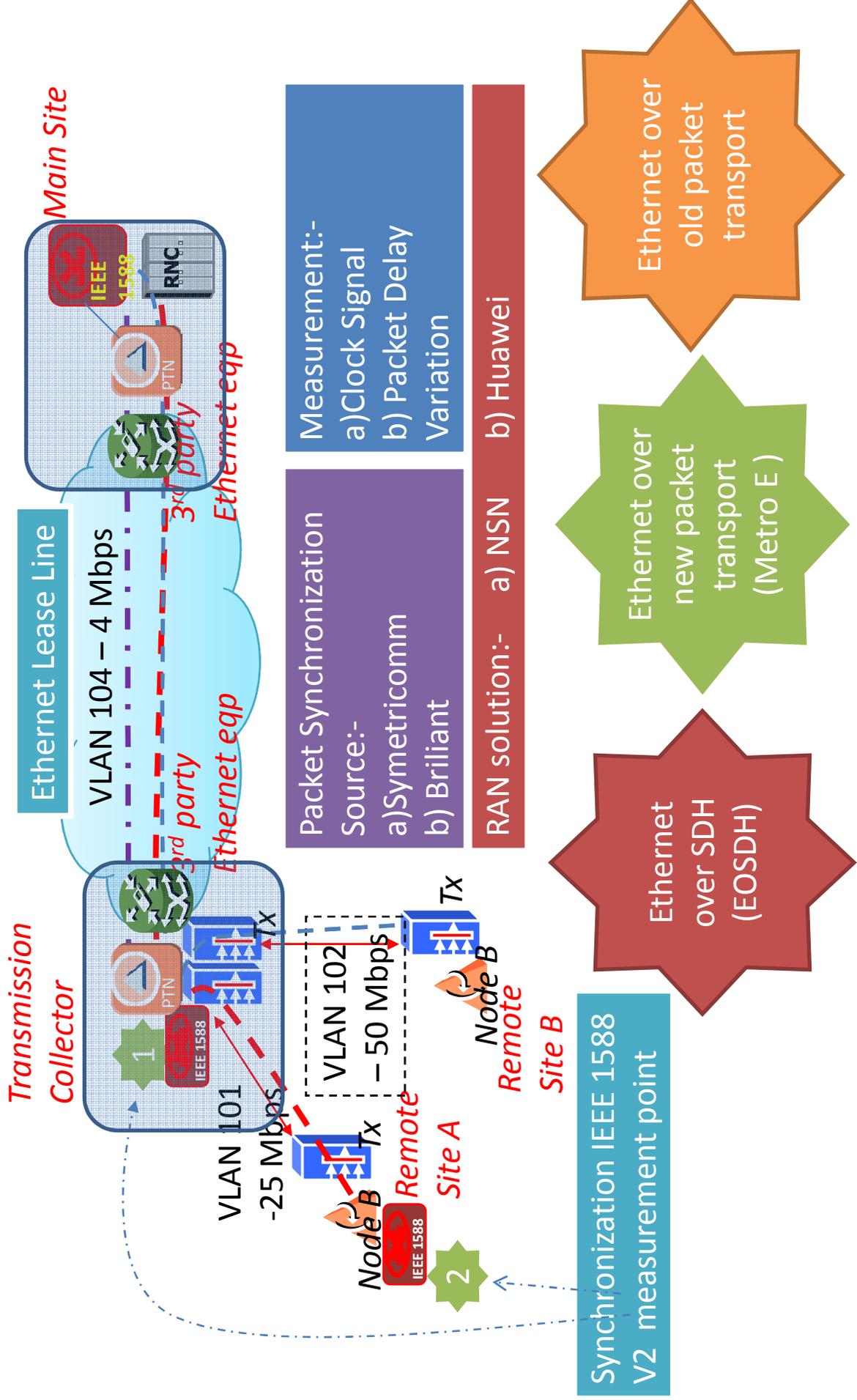
Proof of Concept- 3rd Party Ethernet Leasing



Scope of measurement in the Packet transport over 3rd party Ethernet lease line implementation POC

- Ethernet Lease Line link performance test
- Mobile Access Network performance before migrate to Ethernet Lease Line
- Transmission Network performance Microwave only
- Transmission Network performance E2E
- Mobile Access Network migrate to Ethernet Lease Line medium
- Mobile Access Network performance after migrate to Ethernet Lease Line
- Synchronization IEEE 1588 V2 Testing

Proof of Concept- 3rd Party Ethernet Leasing



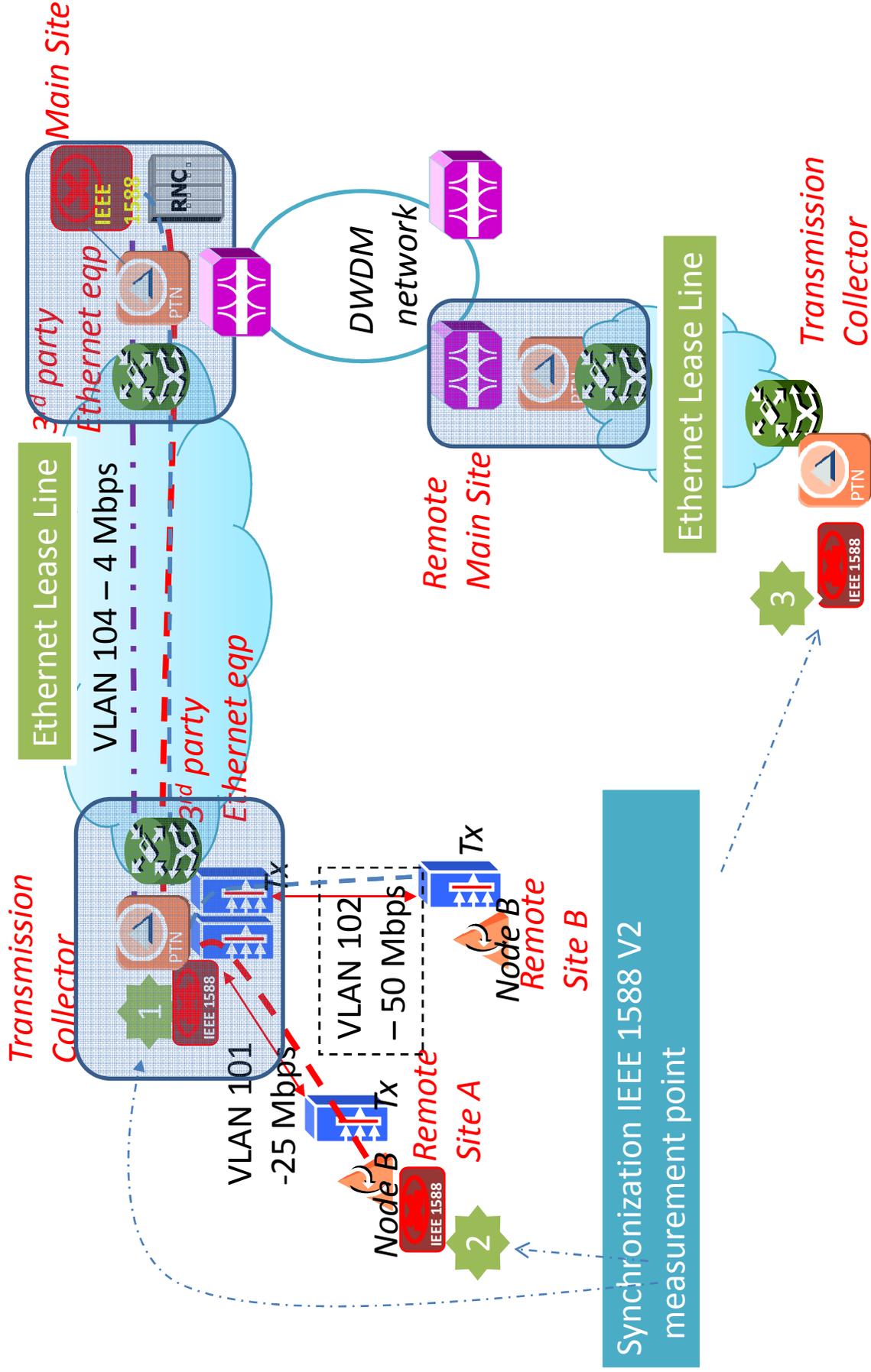
Proof of Concept- 3rd Party Ethernet Leasing



result

Ethernet over SDH over SDH (EOSDH)	Ethernet over new packet transport (Metro E)	Ethernet over old packet transport	Clock Signal	Pass	Pass	Pass	PDV value	High	Low	High
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Proof of Concept- Packet Transport Network



Conclusion

Although Packet Synchronization is complicated to deploy, but until today that is the only light for us to follow. The implementation of packet synchronization seek the following :-

- ✓ Transformation of mobile operator synchronization policy
- ✓ Transformation of synchronization personnel approach
- ✓ Transformation of network architecture to accommodate the technology changes

THANK YOU