

# Applications of Protection Mechanisms in Provider Networks

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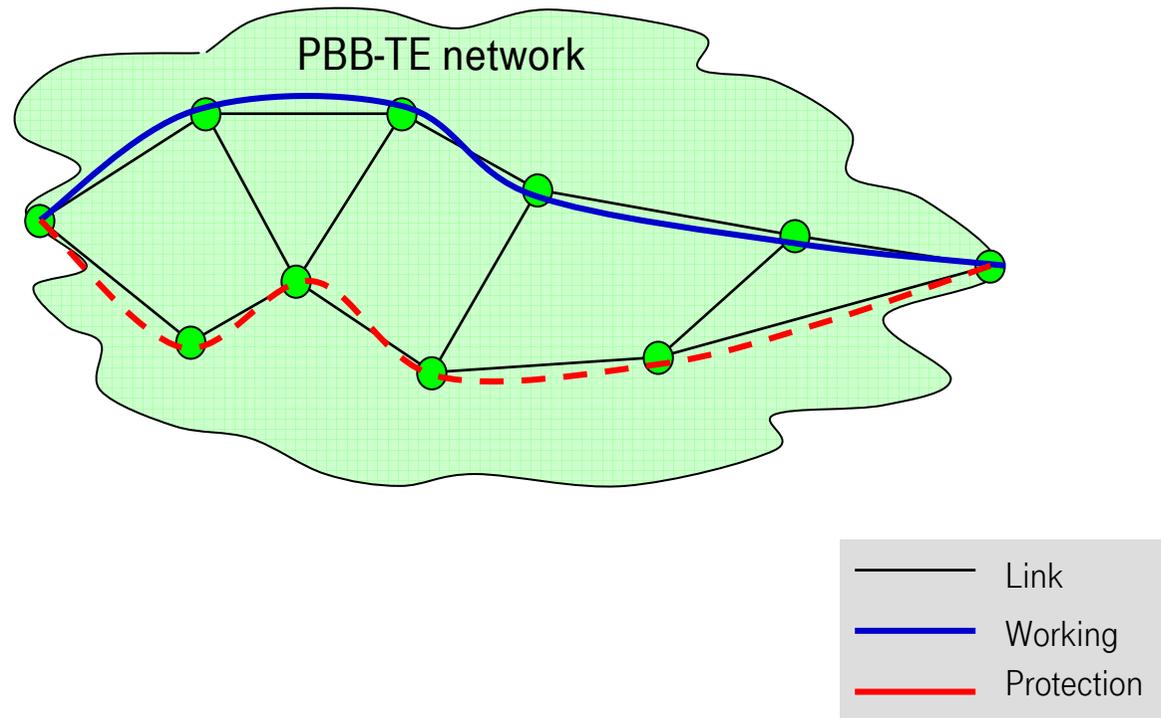
# Application examples of Protection Mechanisms in Provider Networks

- During the September interim a simplified APS protocol without forced-switched and manual switched commands was proposed.
- Protection mechanisms are not only used to protect a services against failure in the network. Provider also use protection functions for network optimization like:
  - Modifications of protected services
  - Modification of unprotected services
  - Replacements of network elements
- By using manual-switch or forced-switch command these action could be carried out with minimal disturbances of services.



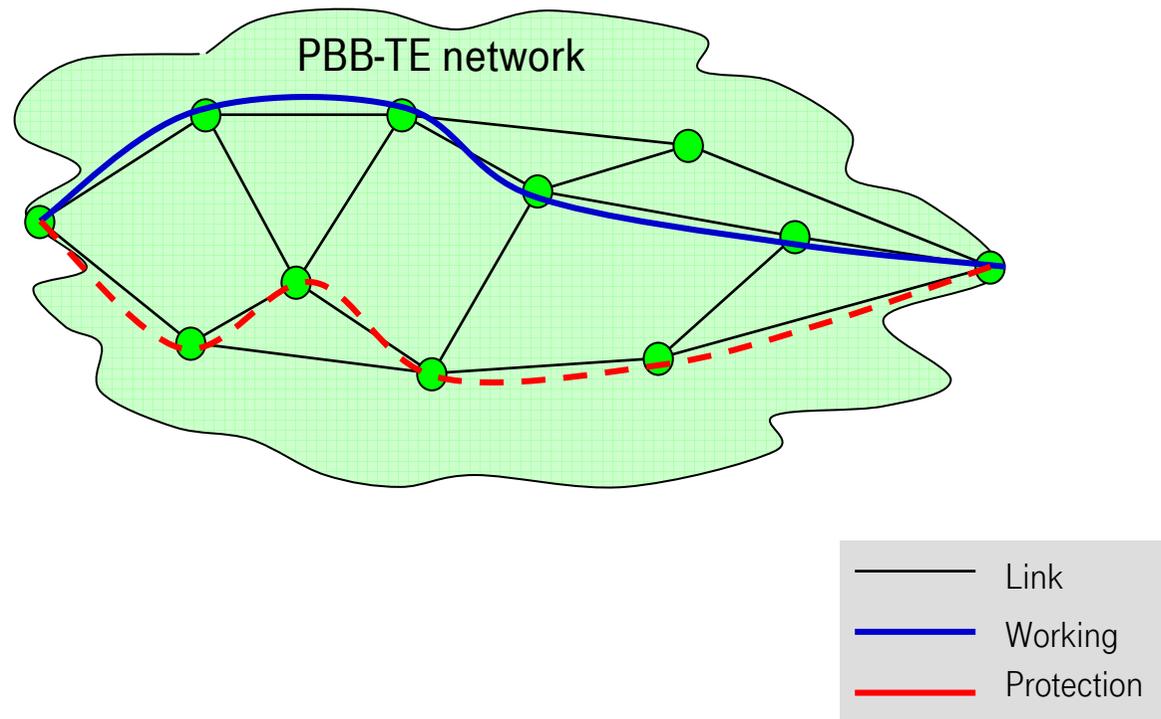
# Modification of Protected Services (1)

- Two diverse connections are setup to form a 1:1 protected services



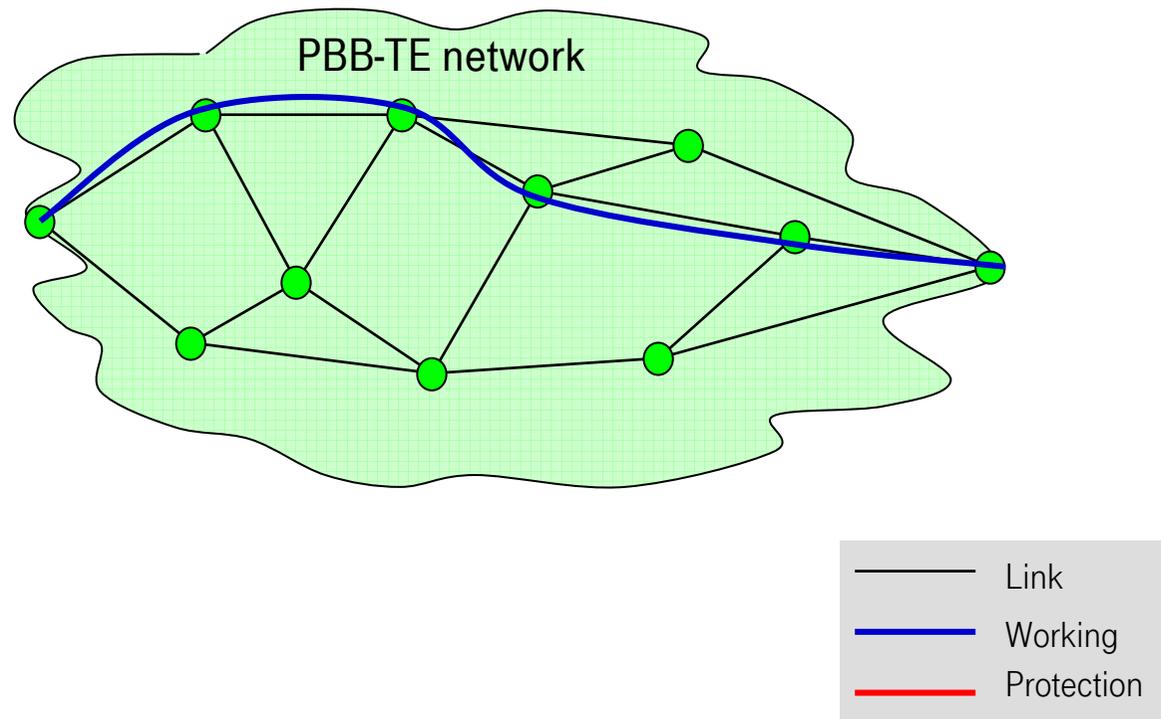
# Modification of Protected Services (2)

- The network growth, i.e. nodes are added and new links between installed nodes are created.
- The original chosen routes are not longer the shortest ones.
- Optimizing the routes should not interrupt the service
- Protection switch command are a useful tool for modifications of services



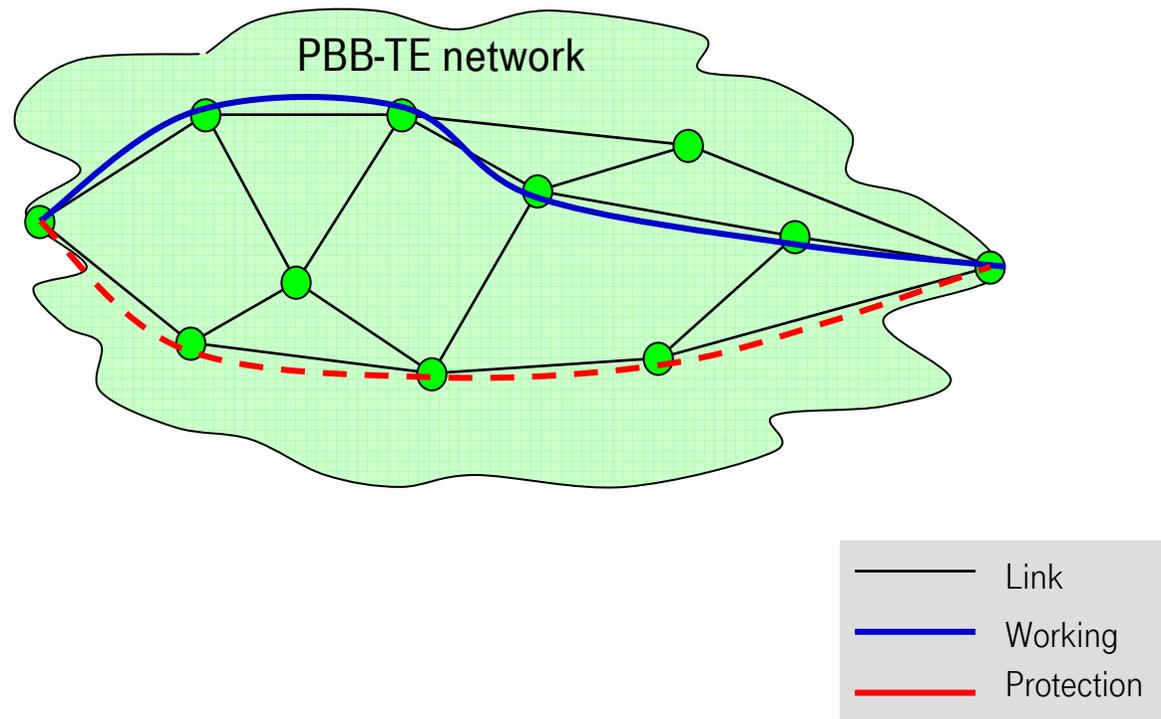
# Modification of Protected Services (3)

- Traffic follows the working connection or is switched to working
- Protection connection is released



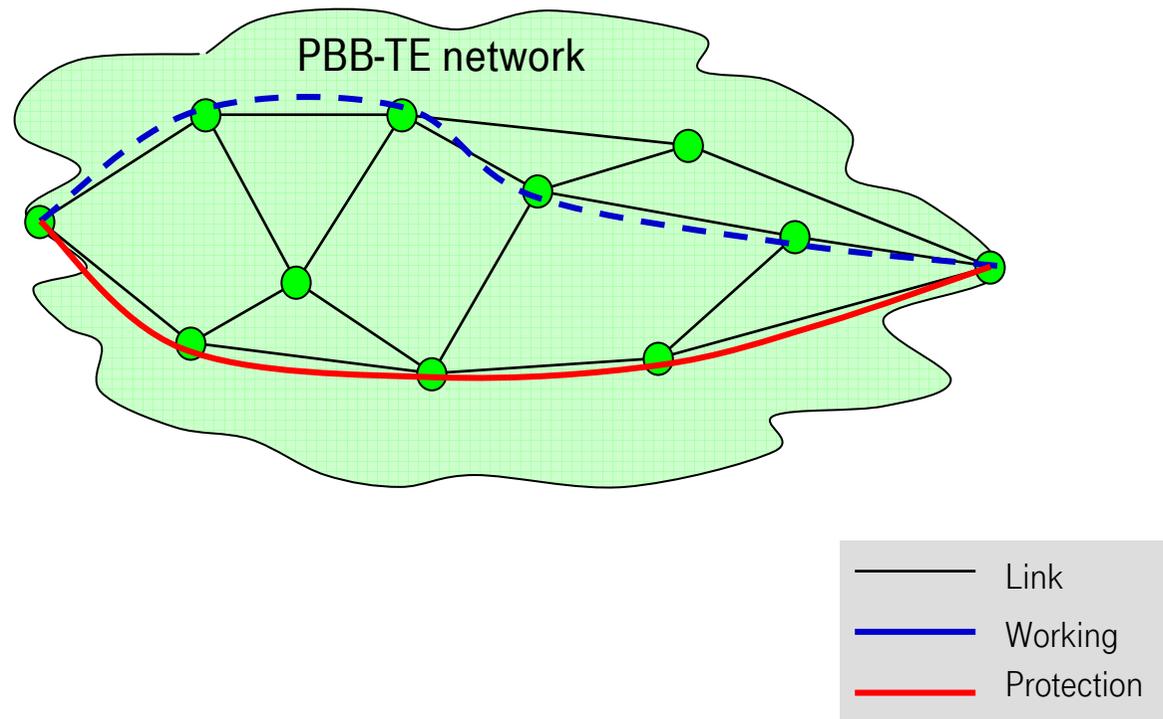
# Modification of Protected Services (4)

- Traffic follows the working connection or is switched to working
- Protection connection is released
- New protection connections is setup



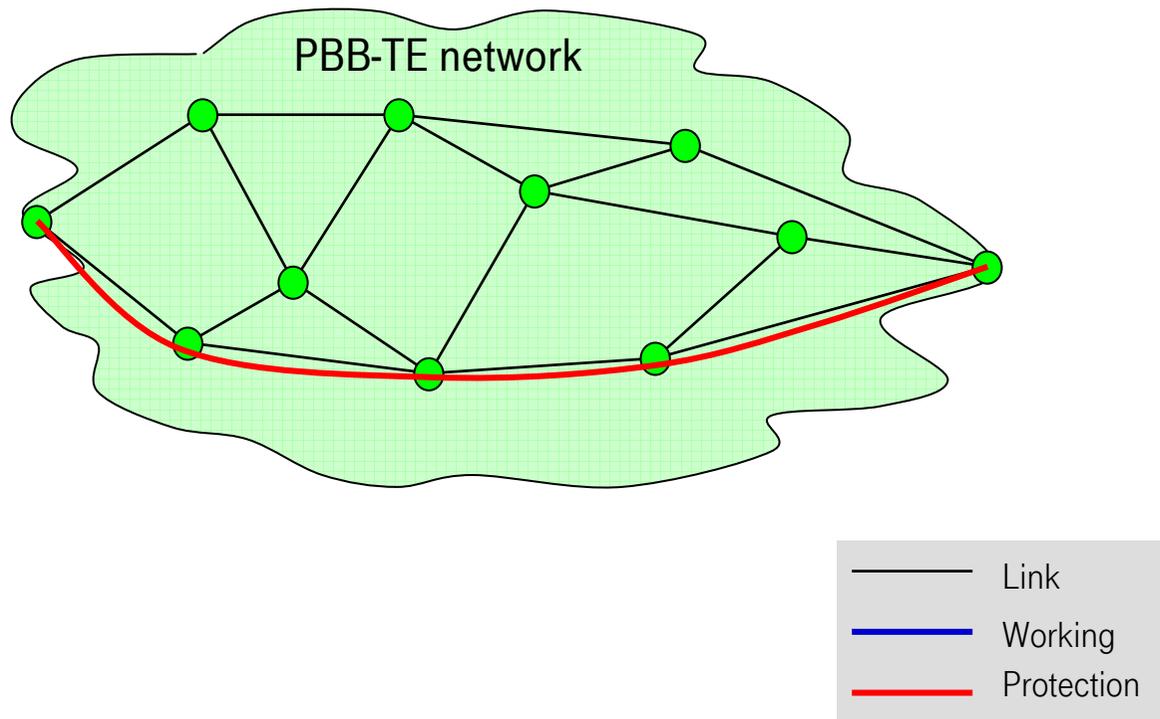
# Modification of Protected Services (5)

- Traffic follows the working connection or is switched to working
- Protection connection is released
- New protection connections is setup
- Traffic is switched to protection



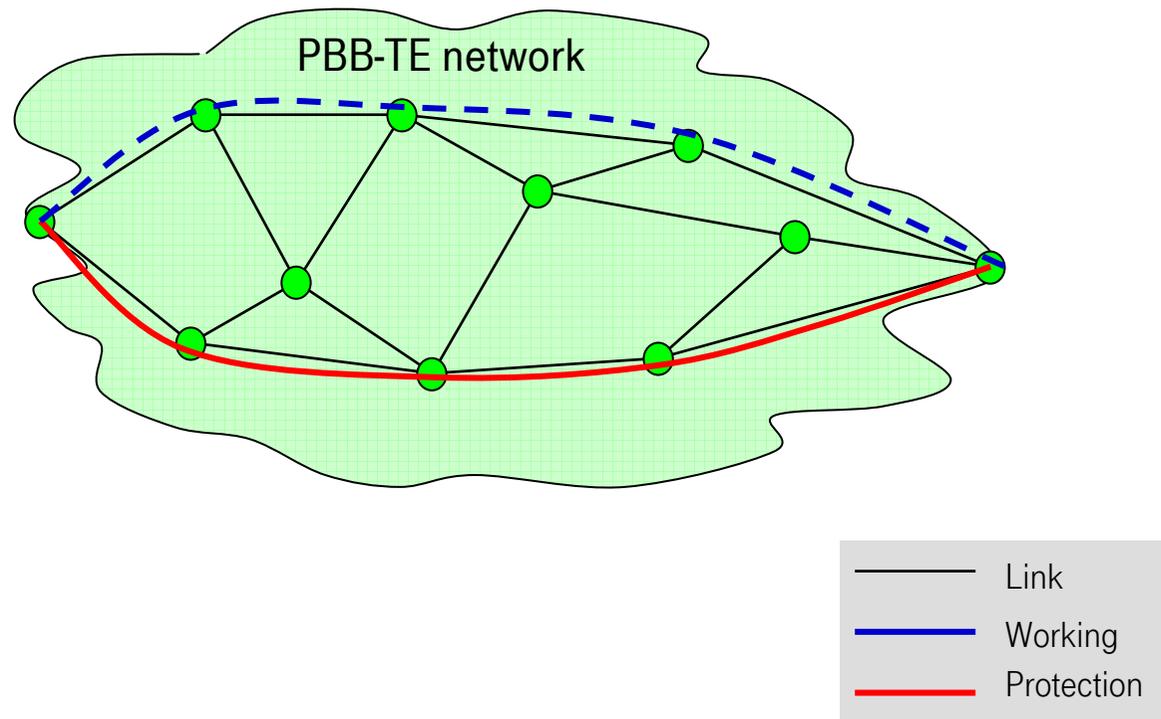
# Modification of Protected Services (6)

- Traffic follows the working connection or is switched to working
- Protection connection is released
- New protection connections is setup
- Traffic is switched to protection
- Working connection is released



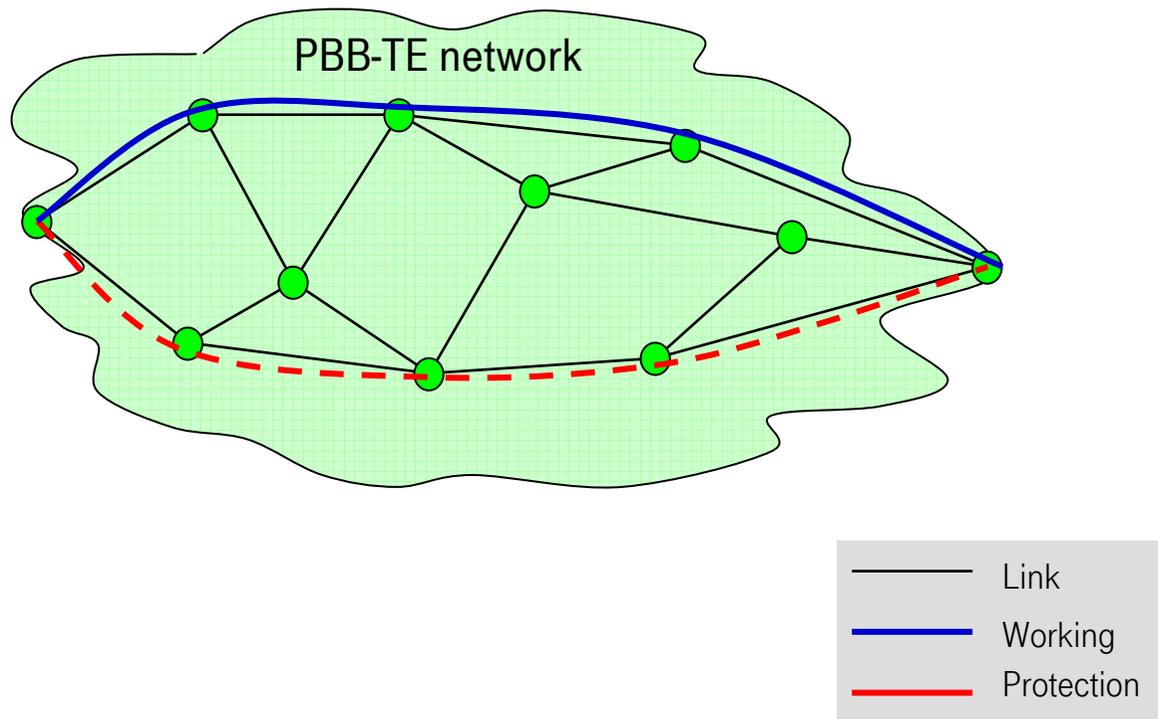
# Modification of Protected Services (7)

- Traffic follows the working connection or is switched to working
- Protection connection is released
- New protection connections is setup
- Traffic is switched to protection
- Working connection is released
- New working connections is set-up



# Modification of Protected Services (8)

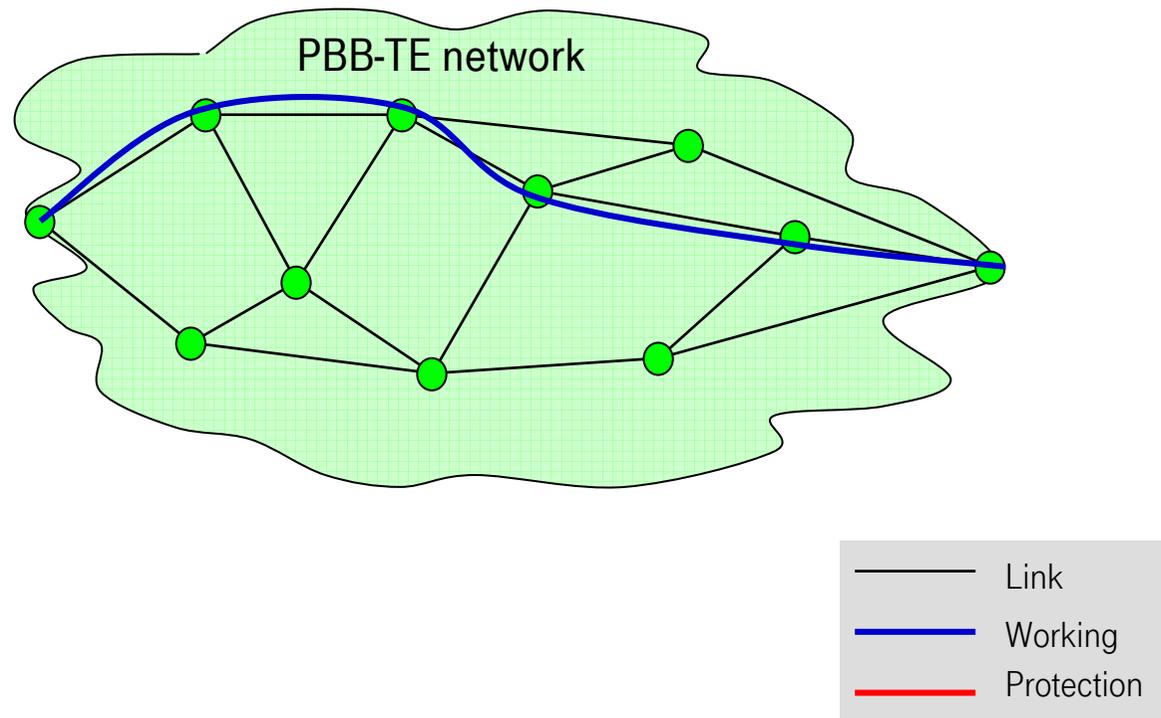
- Traffic follows the working connection or is switched to working
- Protection connection is released
- New protection connections is setup
- Traffic is switched to protection
- Working connection is released
- New working connections is set-up
- Traffic may be switched back





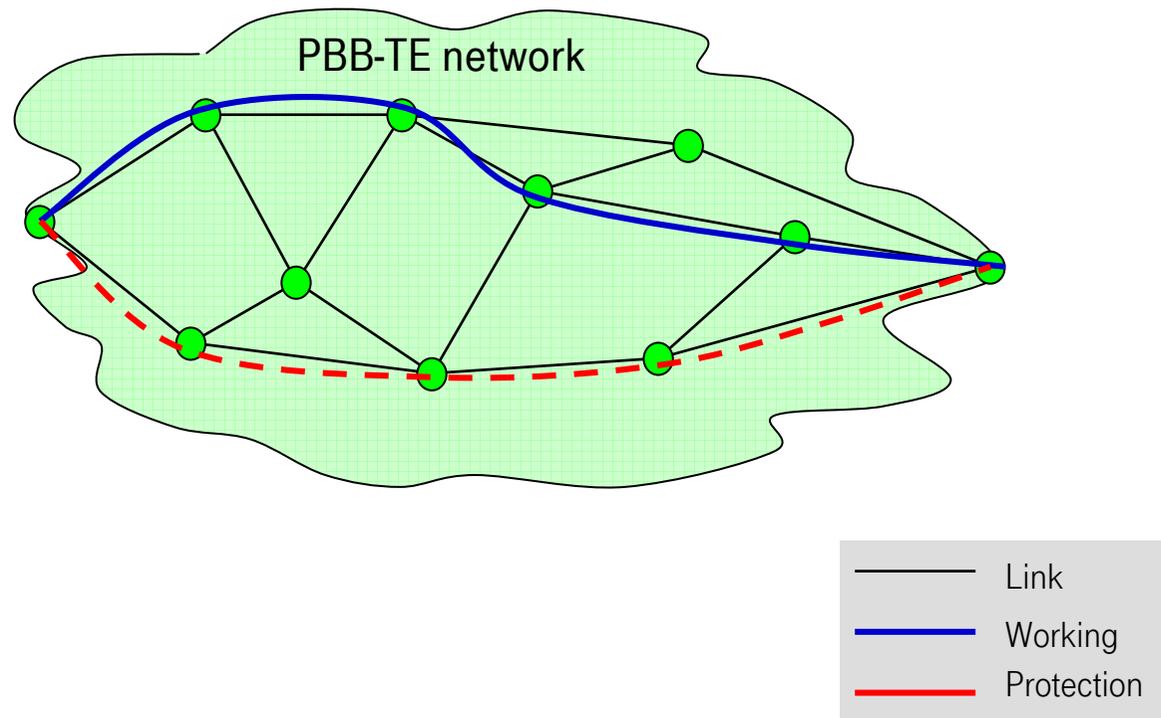
# Modification of Unprotected Services (1)

- The original chosen route is not longer the shortest one.
- Optimizing the route should not interrupt the service
- Protection mechanism are a useful tool



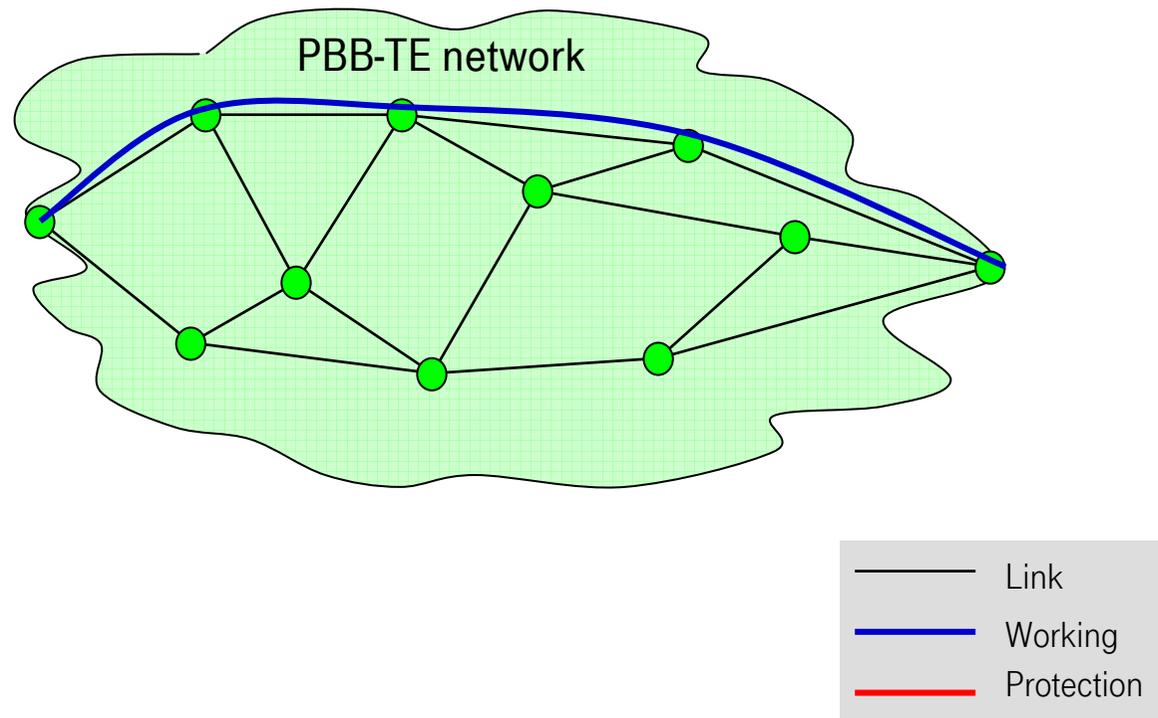
# Modification of Unprotected Services (2)

- The unprotected service is changed to a 1:1 protected service
- The procedure for modification of protected services is applied to the original connection.



# Modification of Unprotected Services (3)

- The unprotected service is changed to a 1:1 protected service
- The procedure for modification of protected services is applied to the original connection.
- Working connections is released after the traffic was switched to working

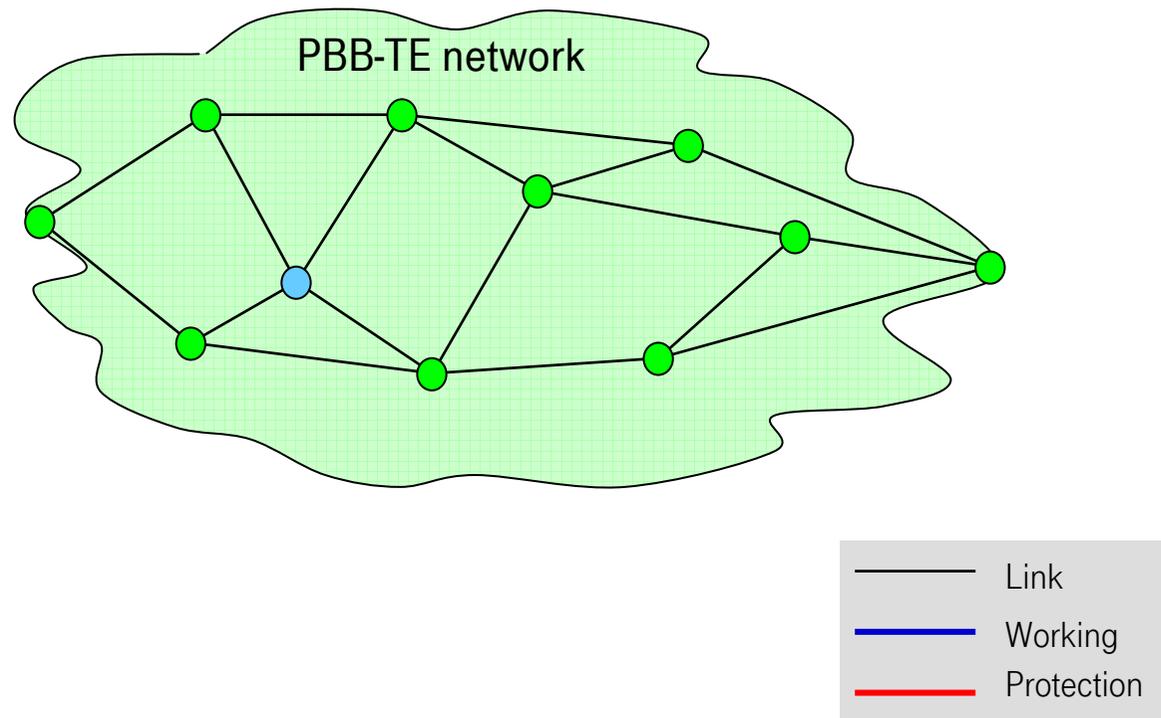


# Replacement of Network Elements

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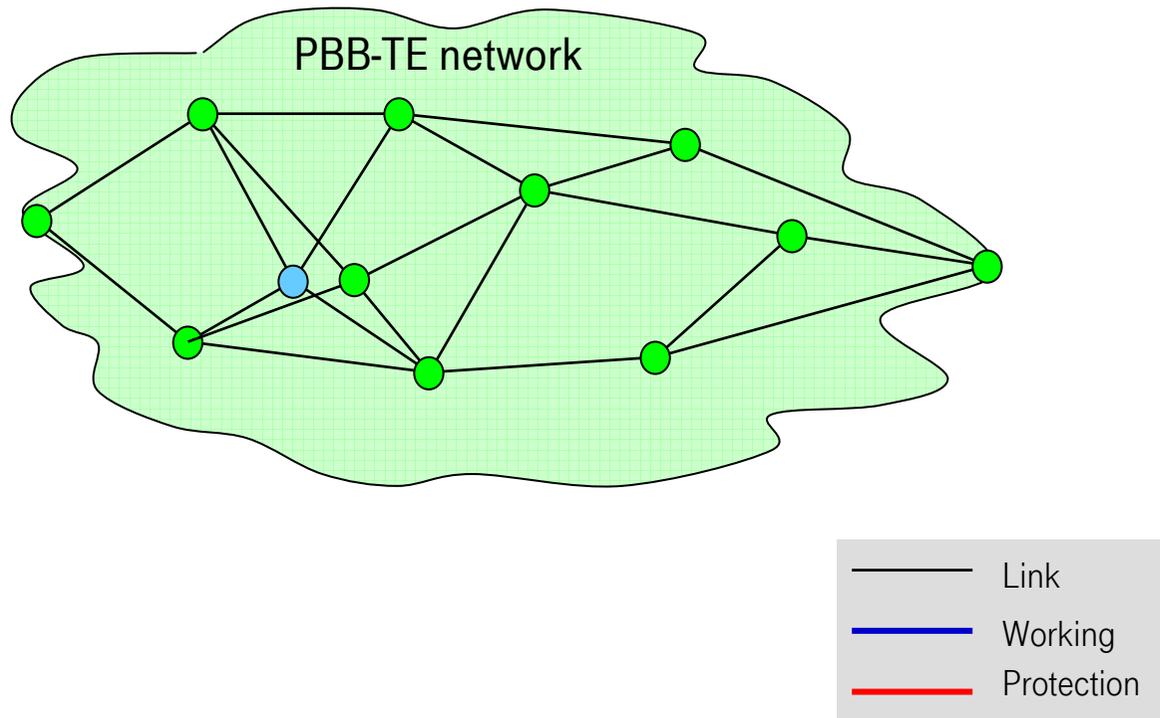
# Replacement of Network Elements (1)

- Blue NE shall be replaced by an NE of a greater capacity



# Replacement of Network Elements (2)

- Blue NE shall be replaced by an NE of a greater capacity
- New NE is installed and interconnected with other nodes
- Connections routed over the blue the NE are moved the new NE by modification of connections as described before



# Conclusion

- Traffic could be switched simultaneously at both ends of a connection when protection switching commands are used. The total interruption time is some tens of milliseconds. Services notices just a loss of frames.
- Without protection switching commands the NMS releases the old connection and setups a one in each NE individually. Such NMS actions are not real time. Switching the traffic to a new route takes same tens of seconds. Services are interrupted and may take serious actions like re-routing in IP networks.

