Migration Considerations and Techniques to MPLS-TP based Networks and Services

draft-sprecher-mpls-tp-migration-02.txt

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Objective

- Presents the motivations for migrating from different transport networks and services to MPLS-TP based packet-centric architecture
- Proposes techniques needed to ensure smooth migration path from different transport networks and services to MPLS-TP

  - From **SONET/SDH, ATM**:

    Providing a **cost-effective**, **scalable** and **flexible** solution

  - From **Ethernet:**

    Providing a **unified**, **scalable** and **flexible, end-to-end** technology toolkit

  - From **IP/MPLS** and **MPLS-TE**:

    Leveraging substantial, existing deployments, providing **cost-effective** and **high-quality** transport and services

  - From **pre-standard T-MPLS**:

    Providing an **interoperable**, **open-standard** solution, ensuring **complete interoperability** and **architectural soundness** with MPLS

Why is smooth migration desirable?

- Enables service providers to maintain their existing investment in the installed base for as long as economically justifiable
    - Allows cost-efficient, scalable and seamless co-existence of legacy technologies with MPLS-TP
- Eliminates the risks associated with upgrading and implementing a new technology
    - Ensures that new implementations work as expected in live networks and that user quality of experience is maintained
- The migration process should be performed without a service break.
    - Existing connections should not be disrupted.
    - Service performance, availability and subscriber experience should remain unaffected.

Migration models

A number of migration models are considered, each with distinct advantages and disadvantages.
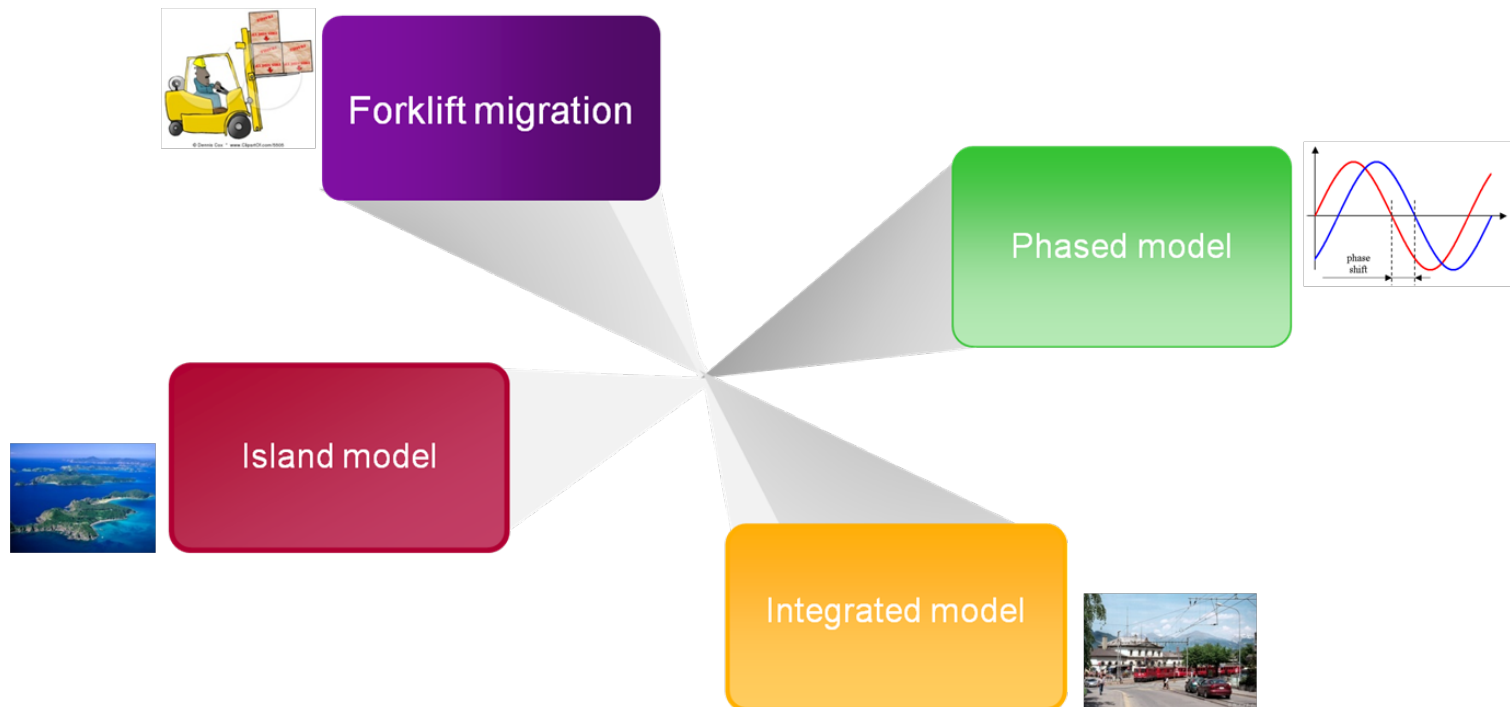
Forklift migration

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Simultaneous upgrade across the entire network:

- Prevents the maintenance of existing investments

- Very risky. New implementations may not work as expected in live networks and user quality of experience may be affected.

- Causes service disruption

Forklift migration is neither practical nor recommended.

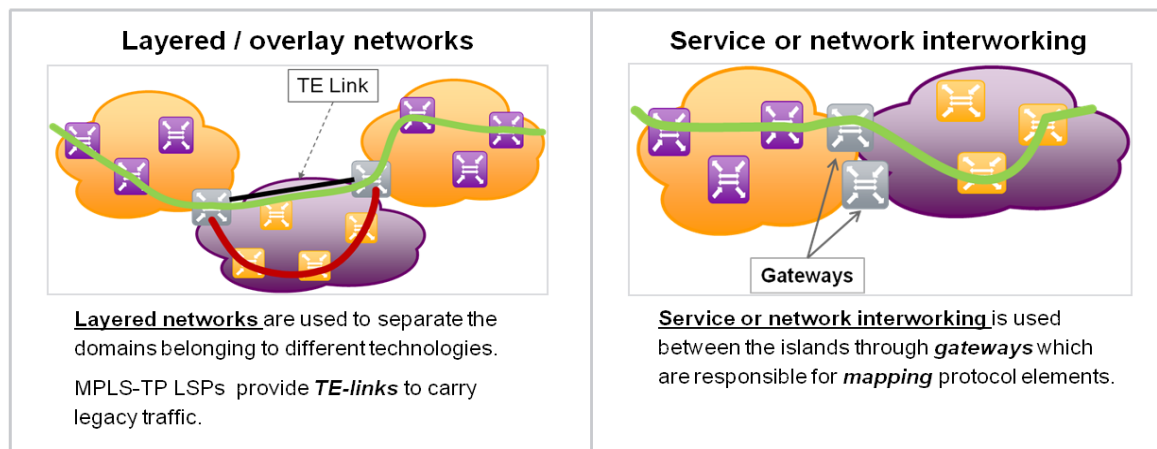- However, it can be performed locally across a section of the network.

Island model

Islands of MPLS-TP nodes and legacy nodes are interconnected via border nodes/gateways (which are responsible for the mapping or adaptation of protocol elements). End-to-end services are delivered over the islands.
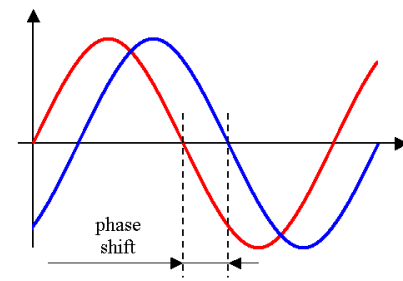
Tools to interconnect the technologies may be based on layered networks or on interworking or mapping between protocols.

Very useful when upgrading is stages

Layered / overlay networks

TE Link

Layered networks are used to separate the domains belonging to different technologies.

MPLS-TP LSPs provide **TE-links** to carry legacy traffic.

Service or network interworking

Gateways

Service or network interworking is used between the islands through **gateways** which are responsible for **mapping** protocol elements.

Phased model

MPLS-TP capabilities are introduced into the legacy network.

- Operators deploy new functions as needed.

  Applicable to software or firmware upgrades, not to hardware upgrades.

- To ensure interoperability:

  - The same capabilities need to be available on all nodes.

  - Vendors need to implement the same set of capabilities.

- Allows rapid upgrade of a network to support enhanced capabilities.

- The phased model is appropriate when:

  - The new capabilities are backward compatible with the legacy technology.

  - The set of new capabilities is defined by the service provider and implemented by all vendors involved in the migration.

Integrated model

New dual-mode nodes with **<u>Integrated MPLS-TP and legacy</u>** functionality in legacy networks, or legacy nodes are upgraded to support MPLS-TP

- Coexistence of the technologies is mandatory. Interworking is NOT required.
- Allows **<u>gradual migration</u>**:
  - Where MPLS-TP transport paths are provisioned, services can be switched from legacy transport and delivered over MPLS-TP transport paths (using make-before-break procedures).
  - Once all devices are MPLS-TP-capable, the features associated with the legacy technology can be switched off. New devices will support MPLS-TP only.

Legend:
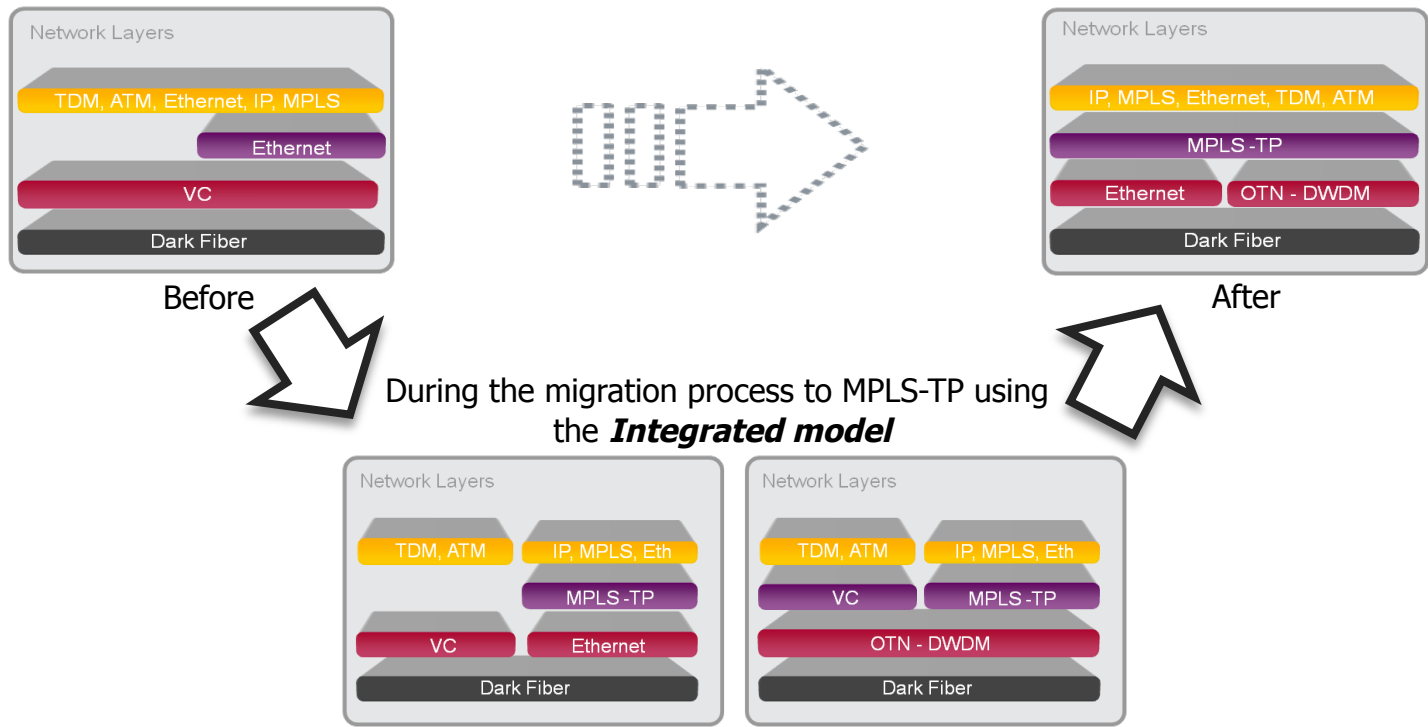- Legacy
- MPLS-TP
- Dual-mode node
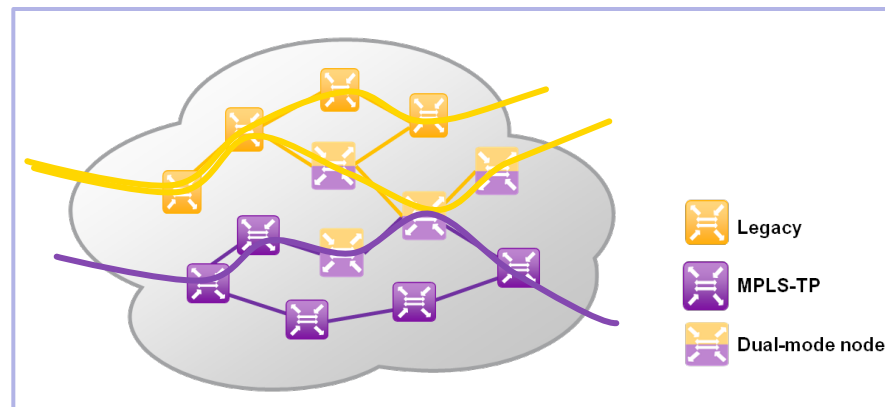
Migration strategies

- Selection of the migration model. Certain issues need to be evaluated, such as:
    - Service providers' network deployment plans and objectives (including the need for investment protection)
    - ***Complexity***
    - Effects on the network operation, ***management costs***
    - ***Risks***, and reliable fallback
    - Security and operational policy
    - Etc.
- Planning of network migration, operation and management during the migration process, policy and migration steps.

Example: Migration from TDM/ATM to MPLS-TP
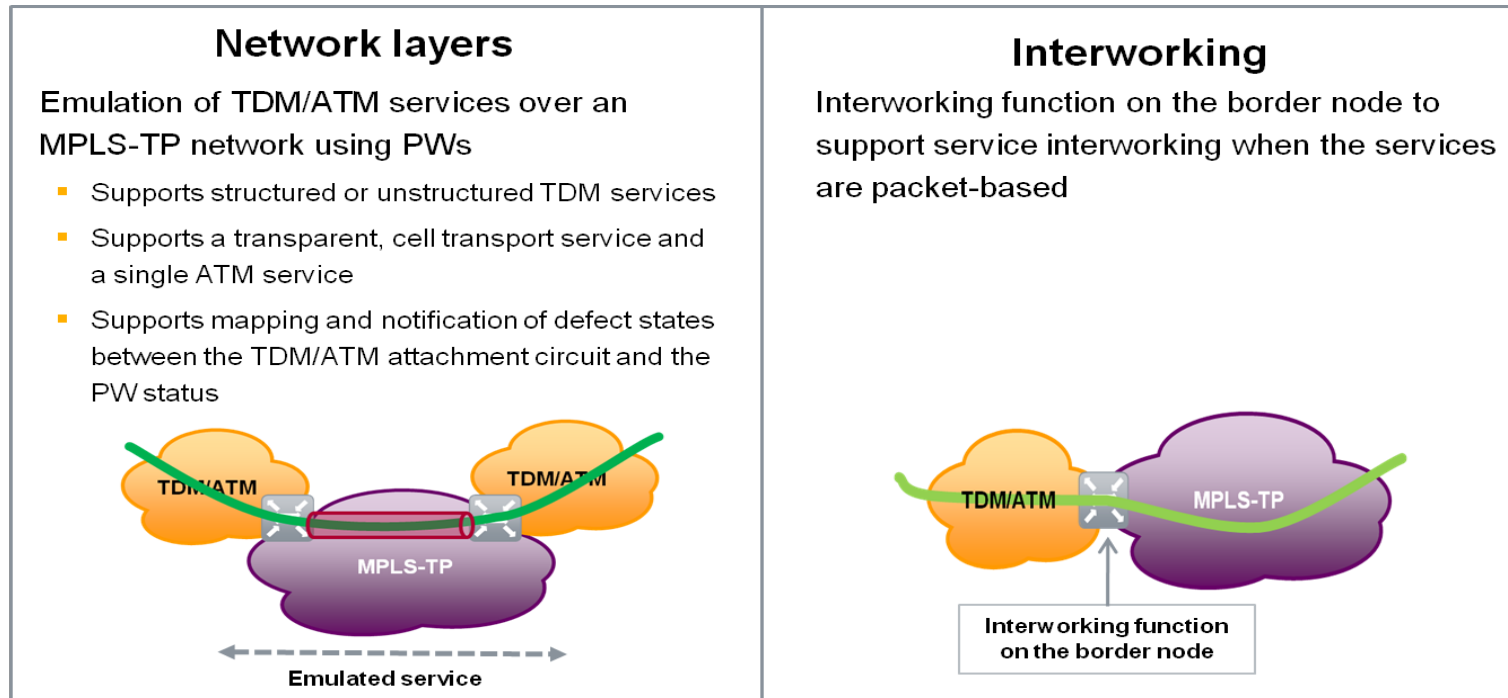
- <u>Phased model</u> – not applicable as hardware upgrade is needed
- <u>Integrated model</u>
  - Transports voice and control traffic (e.g. timing information) over a TDM sub-network
  - Transports data traffic over MPLS-TP (switchover of existing services using make-before-break procedures)

Before

After

During the migration process to MPLS-TP using the *Integrated model*

Example: migration from TDM/ATM to MPLS-TP (cont'd.)

- <u>Island model</u> – techniques to be used:

Network layers

Emulation of TDM/ATM services over an MPLS-TP network using PWs

- Supports structured or unstructured TDM services
- Supports a transparent, cell transport service and a single ATM service
- Supports mapping and notification of defect states between the TDM/ATM attachment circuit and the PW status

TDM/ATM **TDM/ATM**
MPLS-TP

Emulated service

Interworking

Interworking function on the border node to support service interworking when the services are packet-based

TDM/ATM **MPLS-TP**

Interworking function on the border node

Over time, islands of legacy nodes are replaced or upgraded to create new MPLS-TP islands. MPLS-TP islands can be joined together to create a single MPLS-TP network.

Considerations

- **Migrating** to MPLS-TP will likely be a *gradual* process.

  - Migration should be *carefully planned* and *tailored* to each SP's network. One of the strongest motivations for choosing a specific plan will probably be *management cost and complexity*.

  - When migrating from a standard technology to another standard technology it is possible to *benefit* from:

    - the *experience of the wider community*,

    - *standard techniques* that can be of assistance in the migration (e.g. interworking functions, emulations, techniques etc.),

    - the possibility that both technologies can safely *co-exist in the same network.*

- To completely avoid the migration issue, *standard equipment* should be deployed from day one.

  - MPLS-TP is a profile belonging to the MPLS toolkit. It is possible to start deploying the available tools and to subsequently expand the service offering efficiently with minimum costs.

Draft Status

- Informative document

- Authors plan to submit an updated version after the Prague meeting, including:

  - Description of possible migration models

  - Description of specific migration activities and techniques for each transport network or service

- Any input to the document will be highly appreciated! There are different aspects which require specialized expertise.

- The authors solicit service providers to look at the updated document and comment/contribute

Thanks