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	<b>STUDY COMMITTEE D2</b> INFORMATION SYSTEMS AND TELECOMMUNICATION <b>2017 Colloquium</b> <b>September 20 to 22, 2017</b> <b>Moscow – RUSSIA</b>

## **A Smooth Migration Path from TDM to PTN using Hybrid Devices**

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This work describes the design and implementation of a Digital Telecommunication System over Optical Fibers based on Hybrid Devices supporting TDM and PTN technologies at the same time.

Being the first implementation of its kind in the region, it allows the TSO (Transba S.A.) to smoothly transfer and test critical services, traditionally implemented with TDM technologies, to MPLS-TP.

Transba S.A. operates the sub-transmission grid of Buenos Aires Province in Argentina, covering 6100 km of 132 kV lines and 90 substations.

Its communication network for operational services integrates a wide diversity of technologies, including power line carrier, fiber optics and microwaves.

The transport technology was standardized since many years ago as SDH and PDH and it currently covers almost the whole network.

With the irruption of new packet oriented technologies that are capable to meet Power Utilities specific requirements, the company performed extensive laboratory and live tests, verifying the performance and the proper set up for critical applications, like the transmission of teleprotection devices and IEDs implementing differential protection algorithms.

As a second step, the company decided to add into its network hybrid devices that are able to transmit with SDH and MPL-TP technologies at the same time, as a way to produce a smooth migration towards the packet technologies, while protecting the installed base simultaneously.

This first implementation, allowed the user to deploy the needed services for the above mentioned critical applications, in a production environment.

The solution is based in redundant SDH / MPLS-TP optical links that are implemented with Hybris equipment supporting two optical interfaces simultaneously: STM-4 (SDH) and 1 GbE (MPLS-TP).

Every service is transmitted through the GbE optical interface, mapped into MPLS-TP, and the critical services are additionally transmitted by the STM-4 optical aggregate. Therefore, every critical service is transmitted twice and the redundancy is handled externally.

This configuration enabled the company to perform a smooth and safe migration of each and every critical service they require.

Each critical service implemented in SDH, as the reference and proven technology, is implemented in MPLS-TP one at a time. The company allows a long period of time to perform tests and to run the system in normal conditions, trying a diversity of equipment set



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ups, acquiring experience and optimizing the link, until it is considered ready and a new critical service can be migrated.

This implementation will be also used to test applications using a combination the legacy equipment and the new hybrid platform, deploying end-to-end services that are transmitted through SDH sections (legacy) and MPLS-TP sections (hybrid) in order to gain experience in the compatibility of the installed base.

The paper will describe in detail the steps taken by the Main Contractor in order to get the best solution that involved (among others):

- High figures of MTBF for each module involved
- Redundancy topologies for critical circuits
- High values for System Availability
- High Reliability for each Subsystem as well as for the whole System
- Reduced values of MTTR in order to minimize the OPEX for the TSO

It will also describe the system configuration adopted in order allow critical functions to be transmitted by both routes:

- Critical functions through the SDH route
- Critical and non-critical functions through the MPLS route

The work shows how the independence of routes can be obtained, and consequently how both values, System Availability and Reliability for the Power System can be greatly improved by using the new technology in the solution.