Aria Networks

Intelligence for your converging network

iVNT TDM

Planning and Optimisation for TDM Networks

Product Brief

www.aria-networks.com

iVNT TDM

At a Glance

TDM technologies such as SDH and SONET have found their way in to the majority of communication service provider networks thanks to their reliability, manageability and high bandwidth. However, as demand for data services boomed at the start of the 21st Century, the need for greater flexibility in bringing products to market grew, and so demand for IP-based next generation networks increased.

Today these service providers are faced with the task of managing a mix of technologies while executing a strategy of migrating customers and services to new network infrastructure.

Planning and optimising TDM networks has become an exercise in reducing CAPEX while still supporting high-value services in a hybrid, multi-technology network.

Aria Networks iVNT TDM offers service providers a solution for making the most of available resources while supporting the process of migration to NGN.

TDM Network Evolution

Time Division Multiplexing (TDM) is a term and technology that encompasses a number of network types employed by communication service providers. Essentially it is a means of carrying multiple streams of traffic by dividing a resource up in to discrete time-slots. The resource that is divided (multiplexed) may be a physical medium such as a fibre, or it may be another data transport mechanism such as an optical Wave Division Multiplexer (WDM) connection.

TDM was, and in some cases still is, the primary technology deployed in the core and access networks.

Early digital transport systems employed PDH (Plesiochronous Digital Hierarchy) technology which offered reasonably high-speed data transmission but suffered from inflexible and cumbersome multiplexing equipment. SONET (in North America) and SDH (rest of world) superseded PDH networks, offering higher bandwidth, failure protection mechanisms, and substantially more flexibility to switch and terminate a variety of circuit capacities.

TDM is a structured and predictable technology. This is both its strength and its weakness. Over the last decade TDM technology has been used less in new network roll-outs as the demand for flexible IP-based capacity increases. However, one should not overlook the fact that a massive investment in TDM technology remains in the network and that TDM continues to support delivery of revenue generating services.

The Future of TDM Networks

For many communication service providers, TDM network planning is done against a background of rapid change and service innovation, despite what might be expected for such a well established technology. The reality is that service migration, equipment decommissioning, and emulation of critical TDM services can be a highly complex activity.

Whether aggressive migration to IP is underway, or a hybrid IP and TDM approach is used, a number of challenges apply:

- With less strategic growth budgeted for TDM networks, every asset must be 'sweated' to maximize efficient use of existing resources.
- 'What-if' analysis of the TDM network is needed to determine which services should be migrated to next-generation networks to permit TDM decommissioning.
- Re-routing TDM services on to DWDM optical channels and/or hybrid next-generation equipment.
- Decommissioning components of the TDM network requires re-routing and re-optimisation of remaining services.

Maintaining a TDM network, even one that is not growing substantially, alongside a next-generation network requires significant consideration of resource allocation and service routing.

Decommissioning a TDM network is a massive undertaking, and one which requires insight in to the use of the network and optimal strategies for migrating services to next generation networks.

Optimising SDH and SONET Networks with iVNT TDM

At the heart of Aria Networks solutions is the principal that service and circuit routing is the fundamental activity of a communication service provider. Optimal routing creates flexibility and results in efficient use of network resources. Aria Networks iVNT satisfies the planning, optimisation and analysis needs of communication service providers with an OSS application that understands how best to use the network.

With iVNT TDM these core routing, planning and optimisation capabilities are applied to both SONET and SDH networks:

Multi-Technology Suite

iVNT TDM is part of the iVNT planning and optimisation suite of products. Only Aria can offer the breadth of forecasting, planning and optimisation capabilities across the telecom carrier technology spectrum. This enables you to deploy consistent end-to-end capabilities across your organization, reducing integration costs, training and operating expenditure. Aria's iVNT suite also includes support for IP, Optical (WDM), MPLS-TE, and Ethernet networks.

Generic and Abstracted Approach

iVNT TDM is built using the powerful generic routing and path computation capabilities of Aria's iVNT suite. Aria's approach is vendor and technology independent, enabling rapid deployment of new technology capabilities, new network equipment vendors and equipment types, and new service types as well as underpinning powerful planning and optimisation. You can invest in iVNT TDM safe in the knowledge you can continue to leverage its capabilities as your network, services, technologies and vendors evolve in the future, ensuring return on investment is maximized.

Intelligence for the Most Complex Challenges

The Artificial-Intelligence (AI), generic routing, and path computation capability at the heart of iVNT are the most intelligent in the industry. This intelligence has been combined with multi-processor capabilities to enable scalable performance with the addition of cost-effective computing.

Customisable Planning

Environment, planning and optimisation challenges are likely to differ between service providers. Aria's iVNT TDM is a commercial-of-the-shelf (COTS) product, with the flexibility to be customized to fit an existing management/OSS architecture and process framework. iCustomise is integrated with all iVNT products and provides a consistent and standards-based scripting interface allowing the planning process to be customized in-house, by Aria, or by a systems integration partner.

Flexible Integration Capabilities

Data can easily be exchanged with iVNT TDM using the flexible iAdapt framework. iAdapt adapters are available for a range of data formats including XML, CSV, and SOAP. Using iAdapt, the service, network rules and policies can be data-driven, enabling rapid realization of the benefits of iVNT TDM without complex and costly integration effort.

Flexible Deployment Options

Service providers can start with a single-user module of iVNT TDM capable of being deployed on a standard desktop PC and subsequently scale to hundreds of distributed users, multiple technology domains on server-based platforms.

Scalable and Carrier-Grade

iVNT has been used to plan some of the largest telecom networks. Other planning vendors often have to segment a problem in to smaller domains as they cannot cope with the large scale of modern networks. This segmentation leads to unnecessary complexity and suboptimal network plans. iVNT TDM can support tens of thousands of multiplexers and hundreds of thousands of circuits. The multi-processor capabilities of the routing and path-computation engine in iVNT TDM enables performance to be maintained even for the largest and most complex planning and optimisation tasks.

Global Optimisation

iVNT TDM can consider the entire set or a subset of services being planned and optimised and so gain the most efficient use of network resources. Legacy approaches route services in serial which can lead to suboptimal network use or stranded resources. iVNT's unique approach leads to lower equipment needs, lower CAPEX and a reduced operational expenditure.

Optimised TDM Service Routing

iVNT TDM supports routing across TDM networks structured as linear, tree, ring and mesh topologies. In each case it is able to analyze existing circuits and design new services that adhere to the strict high-order and low-order circuit and channel hierarchies defined by

standards such as SDH and SONET.

SDH and SONET networks are frequently deployed in ring topologies, supporting automatic fault tolerance using active and protection paths routed in opposite directions around the ring. iVNT TDM must therefore be able to identify rings, apply routing that acknowledges a directional constraint, and also take the inherent protection offered in to account when analyzing the suitability of the route.

Furthermore, rings are a convenient means of segmenting the network. As such, iVNT TDM treats rings as resources to be explicitly included or excluded from scope for a particular routing or optimisation activity.

Planning Concatenated Services

iVNT TDM's support for concurrent routing enables efficient design of large, concatenated service types such as VCATs (virtual concatenation).

VCAT delivers a high bandwidth service by concatenating several SDH/SONET timeslots. This can be used to support TDM services or NGN services such as Ethernet over SDH/SONET. Two approaches to VCATs are possible, with iVNT TDM able to determine the most effective or cost efficient. The first option is to ensure all concatenated timeslots follow the same route. The second option is to take two or more routes, splitting the bandwidth between each. This may be preferable, or the only option, if bandwidth availability is poor or load-balancing is required. However it carries the risk of differential delay, where data along one path take significantly longer to arrive than other data. iVNT TDM is able to analyze and balance the factors of cost, resource availability, and the risk of differential delay to provide the best solution for the customer and the service provider.

Minimizing Risk and Optimising for Protection

TDM protection types are applied in two ways. Firstly, routes over protected parts of the networks are recognized as being of higher value and higher reliability. Secondly, where the requirement is to design a resilient route iVNT TDM can also create additional protection paths if necessary.

iVNT TDM supports popular protection types for SDH and SONET, including:

- 1+1 – Simultaneous transmission over two fibres
- 1:1 – Deployment of a protection fibre
- UPSR – Uni-Directional Path Switched Ring
- BLSR – Bi-Directional Path Switched Ring
- SNCP – Sub-Network Connection Protection
- MSP-Ring – Multi-Section Shared protection Ring

iVNT TDM routing can also be configured to ensure multiple circuits follow diverse paths, avoiding overlapping nodes, links or 'shared risk' groups of resources.

In a TDM network the level of path protection is one of the few characteristics of a route that may be a discrete variable. While the

active path bandwidth is either deliverable or not, the level of protection available may be somewhere between 'complete' and 'none' depending on the route and hardware redundancy of the underlying resources. iVNT TDM therefore weighs up the cost-benefit of achieving the required service protection levels and can offer 'good enough' protection where iVNT TDM identifies significant cost savings or achieves other higher-priority constraints. However, if resilience is critical, iVNT TDM can apply strict rules to ensure service level agreements are not put at risk.

Optimising TDM Services for Next-Generation Networks

iVNT TDM's abilities to plan efficient circuit and services routes need not be applied only to the day-to-day activities of running a SONET/SDH network. They also provide significant operational benefits to communication service providers in the process of migrating to a next-generation network (NGN).

Sweating assets. As the growth in available TDM equipment slows, iVNT TDM can apply its global optimisation capabilities to ensure the network is being used at maximum efficiency. Where resources are found to be underused, iVNT's routing can be configured to load-balance across these resources.

What-if analysis for migration. Which services should be migrated? Where can network be decommissioned? These are questions iVNT can answer thanks to its unique ability to find globally optimal plans across multiple technology layers. What-if analysis can re-optimise existing services based on multi-layer constraints, identifying which services can be moved to NGN. Furthermore, bottom-up analysis can determine the impact of decommissioning equipment on existing services.

Re-routing services. With a plan in place to migrate services to NGN, iVNT can support the migration of TDM services on to, for example, DWDM channels or IP pseudo-wires. iVNT will account for constraints that come with these hybrid networks, such as the impact of QoS on highly reliable SDH/SONET services, and will attempt to find new routes that meet each service's requirements.

On-going TDM network maintenance. Changes in the network utilization as customer services are either migrated or deprecated result in significant changes to the resource utilization profile. Furthermore, decommissioning of legacy TDM equipment changes the availability of resources. iVNT TDM supports bulk re-optimisation of services, taking in to account these changes. iVNT can propose that services are groomed on to alternative routes, resulting in a de-fragmentation of the network.

Conclusion

Aria Networks iVNT TDM provides the solution to communication service providers needs for optimised SDH/SONET networks and migration of services to NGN. iVNT TDM ensures the return on investment in SDH/SONET is maximized while offering predictability for service evolution and migration activities.

Please visit ***www.aria-networks.com*** to learn more about the iVNT suite of products.

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