Application Overview

# Disaster Recovery Strategy for T1 circuits

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AHK & Associates, Inc.
Telecommunications Consulting

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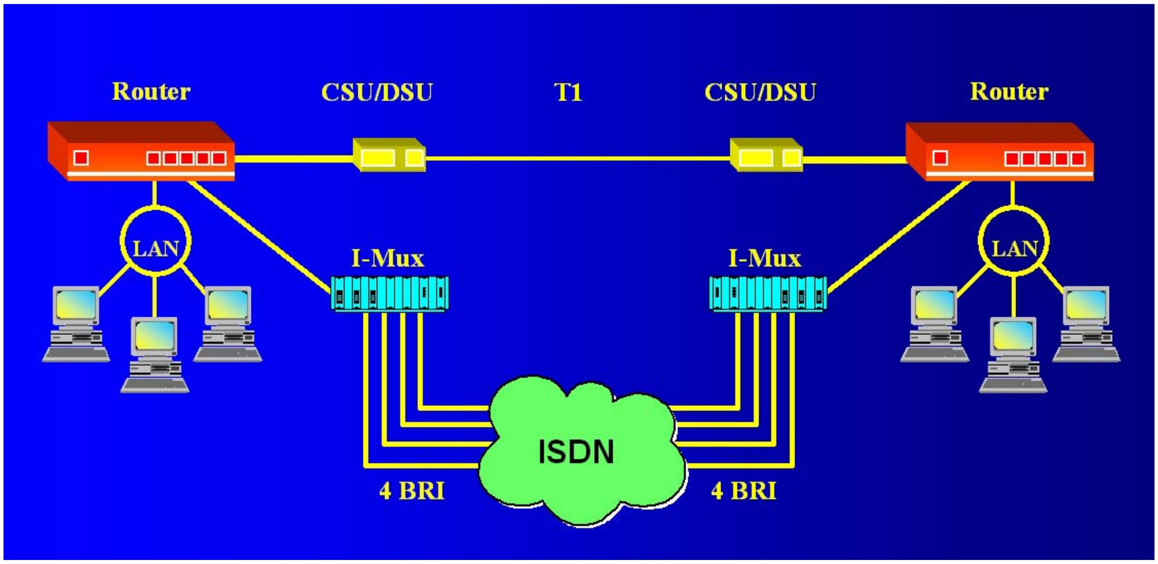
# Disaster Recovery Strategy for T1 circuits

Providing a backup plan for mission critical circuits is not difficult. The process uses multiple ISDN Basic Rate Interface lines (BRI) and some ISDN hardware with very unique properties.

You will need the following items for this application:

1. Alternate Path Switch
2. Inverse Multiplexer
3. ISDN Basic Rate Interface lines (between 1 and 4 BRI)



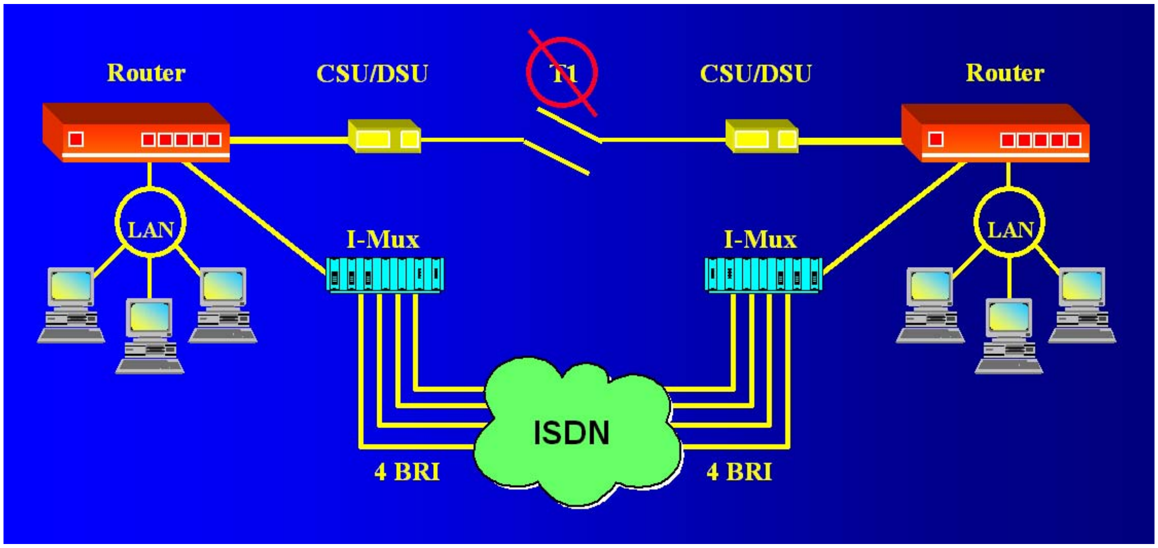

For our example we are connecting two routers together over T1. These routers have dual WAN ports programmed to perform the Alternate Path Switch function. Install the T1 circuit in a normal fashion, either with an external CSU/DSU as shown above, or using an internal CSU/DSU in the router. This is considered the "Primary" connection.

Connected to the second port of the router is an ISDN based Inverse Multiplexer. The Inverse Multiplexer supports up to four (4) ISDN BRI lines. These lines are not used unless there is a Primary circuit failure. The connection between the Inverse Multiplexer and the router will typically be a V.35 interface.

> **Alternate Path Switch (APS)** is a device that will sense when the primary data path has been interrupted, and is no longer available. Under these conditions the APS will attempt to transmit data through the designated "Alternate Path". Routers with more than one WAN port can sometimes be programmed in this manner. Alternatively, you can use a stand-alone dual port CSU/DSU, which has been equipped with APS technology. Companies line Cisco make routers with APS capability, and companies like Control Ware make APS enabled DSU's.

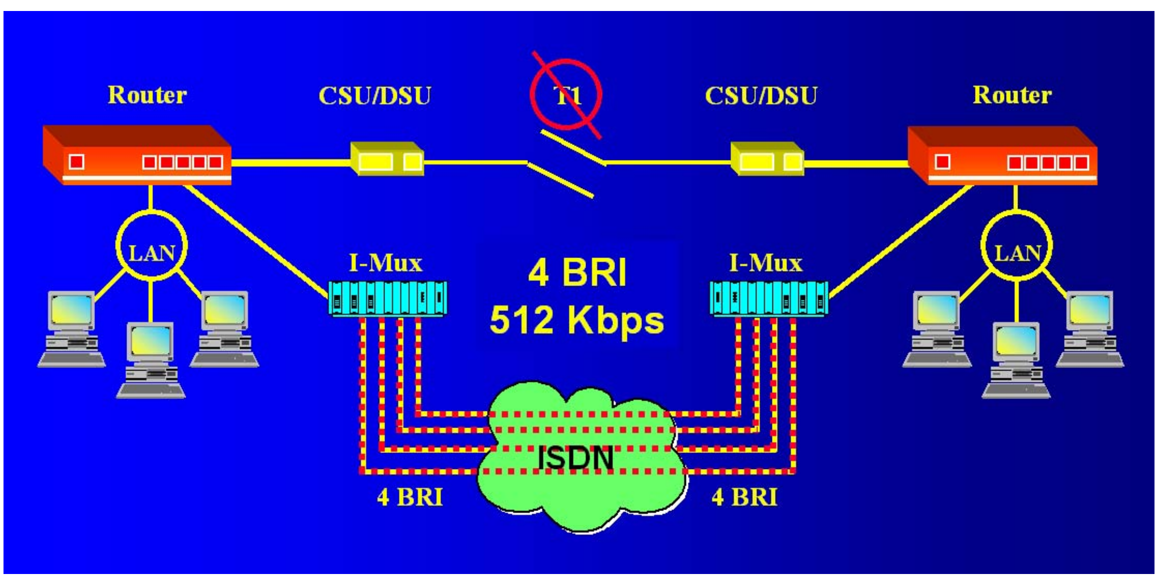
## Circuit Failure

Should the T1 (primary path) fail for any reason, the router will attempt to transmit data through the secondary path.




The Inverse Multiplexer "listens" for data by monitoring the Data Terminal Ready lead in the V.35 interface. This lead, or wire, only becomes energized when the router attempts to send data over the secondary path.

When the Inverse Multiplexer detects an energized DTR condition, this triggers the connection process. The Inverse Multiplexer will dial up multiple circuit switched data calls over the BRI lines. This will connect it to a second Inverse Multiplexer at the distant site. Each BRI line supports two (2) B channels. Each B channel supports a 64 Kbps circuit switched data call. The Inverse Multiplexer can support up to four (4) BRI lines, which will provide total of eight (8) B channels, or 512 Kbps for use in this application.



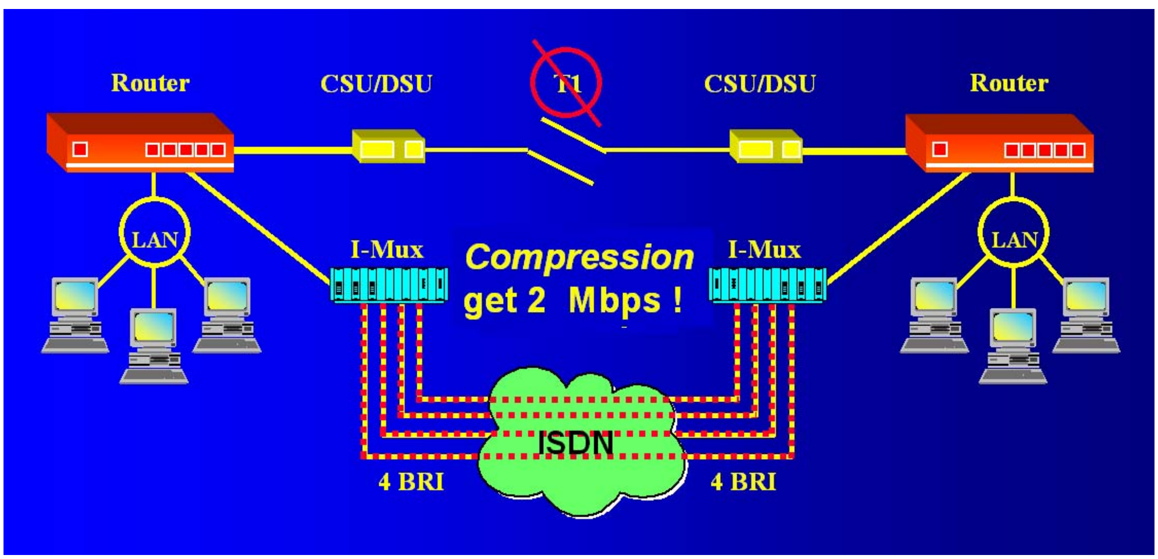
## Inverse Multiplexing and BONDING

The Inverse Multiplexer will aggregate the bandwidth of the individual B channels into a single high-speed “virtual circuit” using a process call BONDING. BONDING (an acronym for Bandwidth On Demand Interoperability Group) is a process developed to deal with the problem of delay in circuit switched calls. Each of the B channel data calls will find a unique path through the network. Since each path will be unique, each path will have a different propagation delay. Since each path has a different propagation delay, the bits streaming down the individual circuits will arrive in a miss ordered fashion. This is because some data will take shorter paths and get there faster, and other data will take longer paths and be delayed by a few milliseconds.

The BONDING process is used to address this problem through its “Delay Equalization” feature. Delay Equalization determines the delay on each circuit, and inserts calculated delay into the shorter circuits. This introduced delay will equalize the data delivery rate across all the circuits. Once this equalization has been established, all the channels will have the same delay, and the packets will no longer be mis-ordered.

## Compression

Adding a hardware compression module to the Inverse Multiplexer provides a 4:1 compression ratio. This will yield a speed of nearly 2 MB per second and is delivered as a fully duplex virtual circuit.




## Set Up Time

The recovery process takes approximately six seconds. Each of the eight data calls is placed, the BONDING algorithm is applied, and the data stream will be re-established. ISDN operates as a fully duplex circuit, you will have approximately 2 Megabits per second of bandwidth.

## Approximate Costs

An Inverse Multiplexer suitable for this application will cost approximately $3,000. We have used the Adtran ISU 512 with great success. You will need up to four (4) BRI circuits at each site, and these cost approximately $40 per month. Try to order then unbundled, with no call packs. You will incur usages charges for the calls places during the primary circuit failure.

## Additional Help

**AHK & Associates Inc.** can help you implement the process in this Application Overview. We can provide complete turnkey installation including; hardware selection and component sourcing, circuit provisioning, and equipment programming. Once it is all done, we provide operational and support training so that you will get the most out of your investment.

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