Independent Reliability Assessment for Dialogic® MSP 1010 Multi-Services Platform

The Dialogic® MSP 1010 Multi-Services Platform has carrier-grade availability. Dialogic bases this claim on the findings of a leading independent analysis firm, SYSREL, LLC, which performed an in-depth reliability analysis on the MSP 1010. The reliability analysts found that the total system availability for a redundant configuration (one active MSP 1010 and one standby) is seven nines (99.999991%), and the total system availability for a standalone, non-redundant MSP 1010 is nearly five nines (99.99745%). Also, the analysts found partial system availability (when the MSP 1010 has a partial loss of service or capacity) for a standalone MSP 1010 to be better than five nines (99.9994%) with a Mean Time Between Failures (MTBF) of 39 years.

SYSREL, LLC is a leading independent system reliability analysis firm with over 35 years of experience performing independent third-party system reliability analyses of telecommunications products. It performed a detailed on-site assessment of reliability and maintainability for the hardware design of the MSP 1010. It also reviewed the software upgrade process and its impact on service, and found that for systems in a 1:1 redundant configuration, software upgrades should have no effect on service. This means that the MSP 1010 is capable of bringing very high carrier-grade availability, at levels often found only in circuit switched networks, to packet-based networks.

Reliability Through Architecture

The MSP 1010 consists of two main components: a field-replaceable tray and a docking station. The tray mates to the docking station to form a single unit. This architecture helps provide the MSP 1010 with high reliability that can significantly reduce total repair time and increase availability. According to the SYSREL analyst report, Dialogic's "unique field-replaceable tray and docking station reduces maintenance time thus achieving a higher availability than similar products of the same hardware complexity (i.e., same MTBSF)."

SYSREL analysts also found that technicians can replace the tray in the field in five minutes, which is significantly faster than average for products of comparable complexity and high reliability. As such, many problems with the motherboard, should they occur, can be corrected in five minutes, including problems relating to the following:

- CPU
- Memory
- DSP farm
- VoIP coder
- TDM circuits
- Ethernet circuits
- Cooling fans
- LED board
- Power supply

Power Supply

The power supply module on the motherboard converts the input voltage to the various output voltages required by the system. Two types of power supply module are available on the MSP 1010: AC-to-DC and DC-to-DC. Although the MSP 1010 does not have a redundant power supply, it can be swapped out with the motherboard in five minutes.

Docking Station

The main component of the MSP 1010 docking station is the TDM network interface I/O board, which contains mostly passive devices such as fuses and transformers. According to SYSREL, the I/O board has a negligible effect on system downtime due to its low failure rate. In the event of an I/O board failure, only TDM circuits are affected; other functions of the system, such as signaling and VoIP routing, are not affected. The three versions of the docking station, each supporting one of these network interfaces, are as follows:

- T1 (28) / E1 (24) bearer spans
- Single DS3

Carrier-Grade Features

The MSP 1010 also offers hardware features typically found only on carrier-grade products, including:

- An On/Off switch on the AC power input
- Optional dual, redundant -48 VDC input feeds with dual circuit breakers
- Front panel color coded status LEDs
- Alarm LEDs
- An LCD display
- Internal fan redundancy (3+1) with six temperature sensors that control the fan speed. Except for repair time, the fans have no effect on availability.
- A power shut-down device

Total System Availability, Redundant Configuration (Active/Standby)

For configurations requiring the highest availability, two MSP 1010 units can be connected in a 1:1 redundant configuration, with one unit active and one on standby. For SS7 signaling, both units are active/active load-sharing. If either unit fails or is down for maintenance, the redundant unit takes over automatically to avoid loss of signaling. One unit maintains active control while the other unit stands by. A failed unit can be replaced easily without interrupting service. SYSREL found that in a redundant MSP 1010 configuration, the total system availability was seven nines (99.999991%) whether the power supply was AC or DC. Average expected downtime per year was found to be less than half a minute (0.40 minutes).

Many MSP 1010s may be added (up to a maximum of 16) to handle TDM traffic. In such a case, a single MSP 1010 failure affects only those trunks connected to the failed unit, a maximum of 32 T1 spans or 24 E1 spans; the other MSP 1010s remain operational. The network may be centralized in a single office or distributed over a wide geographic area. Downtime includes critical hardware failures (motherboard, power input, and power supply module), as well as the repair of non-critical failures (TDM I/O, DSP, VoIP, LED board, and fans) that result in a total loss of service only during repair. The following results from the SYSREL analysis apply to redundant MSP 1010s located in an attended office staffed with trained personnel on-site:

AC

- Availability: 99.999991
- Minutes down per year: 0.0440

DC

- Availability: 99.999992
- Minutes down per year: 0.0375

Partial System Availability, Standalone Configuration

SYSREL found that even a non-redundant, standalone MSP 1010 was found to have five nines (99.9994%) partial availability, meaning a partial loss of service or capacity from failure of DSP, VoIP, and TDM I/O modules. Mean Time Between System Failures (MTBSF) was found to be 39 years. Note that in a redundant configuration, partial system availability would be even higher.

T1/E1 Interface

- MTBSF: 39 years
- Availability: 99.99944%
- Minutes down per year: 2.9141

DS3 Interface

- MTBSF: 39 years
- Availability: 99.99940%
- Minutes down per year: 3.1064

Total System Availability, Standalone Configuration

In a non-redundant, standalone configuration, the MSP 1010 was found to have nearly five nines (99.99745%) total system availability, with a MTBSF of 7.6 years, and average downtime per year of 13.165 minutes. This analysis was performed for both AC and DC power supplies in three TDM I/O configurations. Downtime includes critical hardware failures (motherboard, power input, and power supply module), as well as the repair of non-critical failures (TDM I/O, DSP, VoIP, LED board, and fans) that result in a total loss of service only during repair. The following results apply to a standalone MSP 1010 located in an attended office staffed with trained personnel on-site. Average estimated total system availability approaches the five nines availability typical of "carrier-grade" equipment.

AC

- MTBSF: 7 years (61,367 hours)
- Availability: 99.9972
- Minutes down per year: 14.45 minutes

DC

- MTBSF: 8.2 years (71,666 hours)
- Availability: 99.9977
- Minutes down per year: 11.88

Methodology

To estimate system downtime and availability, SYSREL developed Reliability Block Diagrams (RBDs) and Markov models to represent the various failure modes and repair actions required to restore service. SYSREL analysts calculated hardware failure rates based on data from the component suppliers and on Telcordia SR-332, Reliability Prediction Procedures. The analysis included combinations of the following configurations and scenarios:

- Two power supply options (110 VAC and -48 VDC)
- Three network interface options (T1/E1, DS3, and STM0)
- Standalone MSP 1010s
- MSP 1010s in a 1:1 active/standby redundant configuration
- Partial system failure
- Total system failure

Note: This analysis is based on Mean Time Between Failures (MTBF) calculations, which estimate statistical MTBF based on Mil-spec parts count analysis techniques. Actual performance of any particular piece of equipment is affected by its installation, application, and environment, and may differ from these estimates. No warranty is provided or liability assumed or implied on the basis of these calculations.

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The reliability analysis discussed in this technology brief was provided by SYSREL, LLC.

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