IMG 1010
Independent Reliability Assessment

The Cantata IMG 1010 Integrated Media and Signaling Gateway has carrier-grade availability. That's not just Cantata's claim, that's the opinion of a leading independent analysis firm, System Reliability Consultants, which recently completed an in-depth reliability analysis on the IMG 1010. The reliability analysts found that the total system availability for a redundant configuration (one active IMG 1010 and one standby) is seven nines (99.999991%). The total system availability for a stand-alone, non-redundant IMG 1010 is nearly five nines (99.99745%). And, the analysts found partial system availability (when the IMG 1010 has a partial loss of service or capacity) for a stand-alone IMG 1010 to be better than five nines (99.9994%) with a mean time between failure of 39 years.

System Reliability Consultants is a leading independent system reliability analysis firm with over 35 years of experience performing independent third-party system reliability analyses on new telecommunications products. It performed a detailed on-site assessment of reliability and maintainability for the hardware design of the IMG 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 at all on service. This means that the Cantata IMG 1010 can bring very high carrier-grade availability, often found only in circuit switched networks, to packet-based networks.

Cantata'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)"
- System Reliability Consultants

Reliability Through Architecture

The Cantata IMG 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 is key to the Cantata IMG 1010's high reliability, significantly reducing total repair time and increasing availability. The analysts found that technicians can replace the tray in the field in five minutes, significantly faster than average for products of comparable complexity and high reliability. So any problem with the motherboard can be corrected in five minutes, including problems with the:

- CPU
- Memory
- DSP farm
- VoIP Codec
- 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 Cantata IMG 1010: AC-to-DC and DC-to-DC. Although the IMG 1010 does not have a redundant power supply, it can be swapped out with the motherboard in five minutes, so the hardware's carrier-grade reliability was proven again and again throughout this analysis.

Docking Station

The main component of the IMG 1010 docking station is the TDM network interface I/O board. These I/O boards contain mostly passive devices such as fuses and transformers. According to System Reliability Consultants, 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. There are three (3) versions of the docking station, each supporting one of these network interfaces:

- T1 (28) / E1 (21) bearer spans
- single DS3

Carrier-Grade Features

The Cantata IMG 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 -48V DC 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

cantata™ TECHNOLOGY

IMG 1010
Independent Reliability Assessment

Total System Availability, Redundant Configuration (Active/Standby)
For configurations requiring the highest availability, two Cantata IMG 1010 units can be connected in a 1:1 redundant configuration, with one active and one 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, with no loss of signaling. One unit maintains active control while the other unit stands by. A failed unit can be replaced easily without interrupting service. System Reliability Consultants found that in a redundant IMG 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 Cantata IMG 1010s may be added (up to a maximum of 16) to handle TDM traffic. In this case, a single Cantata IMG 1010 failure affects only those trunks connected to the failed unit, a maximum of 32 T1 spans or 24 E1 spans. All other Cantata IMG 1010s remain operational. The network may be centralized in a single office or distributed over a wide geographic area. Downtime includes all 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 redundant IMG 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, Stand-Alone Configuration
System Reliability Consultants found that even a non-redundant, stand-alone IMG 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 failure was found to be 39 years. Note that in a redundant configuration, partial system availability would be much higher.

T1/E1 Interface
- Mean time between system failure 39 years
- Availability 99.99944%
- Minutes down per year 2.9141

DS3 Interface
- Mean time between system failure 39 years
- Availability 99.99940%
- Minutes down per year 3.1064

Total System Availability, Stand-Alone Configuration
In a non-redundant, stand-alone configuration, the IMG 1010 was found to have nearly five nines (99.99745%) total system availability, with a mean time between system failure 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 all 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 stand-alone IMG 1010 located in an attended office staffed with trained personnel on-site. Average estimated total system availability approaches the five-nines typical of "carrier-grade' equipment.

AC
- Mean time between system failure - 7 years (61,367 hours)
- Availability 99.9972
- Minutes down per year: 14.45 minutes

DC
- Mean time between system failure - 8.2 years (71,666 hours)
- Availability 99.9977
- Minutes down per year: 11.88

Methodology
To estimate system downtime and availability, System Reliability Consultants developed Reliability Block Diagrams (RBDs) and Markov models to represent the various failure modes and repair actions required to restore service. The 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 V AC and -48V DC)
- three network interface options (T1/E1, DS3, and STM0)
- standalone IMG 1010s
- IMG 1010s in a 1:1 active/standby redundant configuration
- partial system failure
- total system failure

cantata™ TECHNOLOGY

Corporate Headquarters: 410 First Avenue, Needham, MA 02494, USA
Tel: +1 (781) 449-4100 • **Fax:** +1 (781) 449-9009 • **Email:** info@cantata.com • **Web:** www.cantata.com
Cantata Technology maintains multiple locations worldwide in North America, Asia and Europe.