Intelligent Tools for Extended Boundary Scan
Why Boundary Scan?

The requirement to test electronic components is as old as the electronics industry itself. While functional test has been used in the early days, in the 1970s the era of In-Circuit-test (ICT) began. ICT is based on mechanical access to test points on the printed circuit board (PCB) through so-called bed-of-nail adapters, providing the means of accessing the Unit Under Test and dividing it into individually testable partitions (structured test). This extraordinary test technology dominated the testing of electronics worldwide for many years, continuously improving, until one problem became impossible to solve – continuously reduced test access. Ever decreasing mechanical test access is the result of more and more complex board structures and the use of space saving package technologies such as BGA (Ball Grid Array), microBGA and CSP (Chip Scale Package).

A new test technology called Boundary Scan (also known as JTAG) was developed and was standardized in 1990 as IEEE-Std. 1149.1. Boundary Scan. A test access methodology as revolutionary as ICT was in its time, offers the advantage of structural device, board, and system level test access throughout the whole product life cycle without the need for any invasive nail access. Reducing cost of test and providing better test coverage.

GÖPEL electronic is one of the pioneers in Boundary Scan applications and a worldwide leading vendor of comprehensive software and hardware tool sets, offering Intelligent Solutions for Extended Boundary Scan.

Due to our worldwide presence, our extraordinary service and customer support commitment, and the design of our products to customer requirements, we are the favoured supplier in many industries such as telecommunication, Automotive and EMS. GÖPEL electronic is an ISO 9001 certified company since 1996. Highest customer satisfaction and product quality are our ultimate goal.

GÖPEL electronic

GÖPEL electronic GmbH was established in Jena, Germany, in 1991, and over the years opened branch offices in Europe and the United States of America. Before starting GÖPEL electronic, its founding members were working on test technologies for integrated circuits at Carl-Zeiss Jena, Germany. GÖPEL was the first European supplier of software and hardware solutions for Boundary Scan applications. Being a technology driver from the very beginning, CASCON GALAXY®, the first fully integrated software environment for Boundary Scan application development, and the first IEEE 1149.1 controller card for PXI are only two among many firsts introduced by GÖPEL electronic. Our philosophy of developing “intelligent tools” differentiates us from other vendors and allows us to support extended Boundary Scan applications.
What is Boundary Scan?

Boundary Scan is possibly the most resourceful test access technique around. Similar to In-Circuit Test (ICT) but without physical bed-of-nail adapters, it detects structural fault locations by utilizing thousands of test points - with only four test bus lines. Boundary Scan essentially means “testing at the periphery (boundaries) of a circuit”. In addition to the core logic and the “test points” (Boundary Scan Cells), an IEEE-1149.1 compliant IC (Integrated Circuit) also features some test control logic. The Boundary Scan Cells, serve as test points to access the signals included in a specific test, are integrated between the core logic and the physical pins of the IC. This IC level test access architecture and the test bus connections between IEEE-1149.1 compliant devices are necessary for the use of Boundary Scan. With those resources it is possible to:

- test particular components (device test)
- test the connection between I/O pins on the PCB and even between multiple PCBs
- test the function of complete boards under operating conditions as well as in stress test environments

Not all components on the board have to be Boundary Scan compliant devices to achieve good test coverage. Even if only one component meets the requirement, Boundary Scan can be used for certain test applications. Unlike other test access methodologies, Boundary Scan can be utilized from the beginning to the end of a products life cycle for the following applications:

- design validation
- prototype verification
- device, board, and system level test
- in-system programming

Please ask us to run a testability analysis on your boards to show you the test access available and discuss possible Boundary Scan applications on your design.

For details please refer to the Boundary Scan software section on www.goepel.com.

Boundary Scan has many advantages and enormous cost savings potential:

Benefits:
- usable throughout the entire product life cycle
- no bed-of-nails fixture necessary – nevertheless offering very high test and fault coverage
- accelerates development of new products ➞ reduced Time-to-Market
- test program creation in a short time ➞ fast turnaround, e.g. for design changes
- improved product quality by combining testing and “just-in-time” on-board/in-system programming on production floor

Cost savings:
- low initial investment and cost of maintenance compared to other test technologies
- no storage costs, e.g. for test fixtures or for pre-programmed devices
- fast amortisation ➞ high Return-On-Investment

Do not hesitate to ask us for a customized cost savings plan by utilizing Boundary Scan for your test applications in respect to your individual production volume. You can find further information on our website at www.goepel.com.
Intelligent Boundary Scan Software

The performance of a Boundary Scan system is defined primarily by the capabilities and architecture of the software used. As the first vendor worldwide, GÖPEL electronic developed an Integrated Boundary Scan Development Environment in 1991, known as SYSTEM CASCON™. This unique Boundary Scan Workbench has been continuously improved with new intelligent tools and innovative new software features. Today, in its fourth generation, SYSTEM CASCON™ has acclaimed the status of an open graphical Boundary Scan Operation System with special features allowing extending the test coverage to the complete Unit Under Test (UUT).

**Six intelligent reasons to choose SYSTEM CASCON™**

**Intelligent Data Base**

An intelligent, hierarchical data base built into SYSTEM CASCON™ references all structural and functional information available about the whole UUT. This allows the automated handling of non-Boundary Scan components such as R, L, C, buffer, memories, etc. in test generation, execution and diagnosis.

**Intelligent Programming Language**

Based on its intelligent data base, SYSTEM CASCON™ provides a powerful Boundary Scan programming language (CASLAN) that allows for advanced debugging of test applications. CASLAN can even include user DLLs to control external test instruments, allowing for extended Boundary Scan applications.

**Intelligent Tools**

Every tool in SYSTEM CASCON™ utilizes the information available in the comprehensive UUT data base and provides intelligent algorithms for test generation, fault diagnostics, or data analysis. The Automated Test Pattern Generation (ATPG) tools, for example, generate CASLAN source code with 100% Boundary Scan fault coverage and active Anti Ground Bounce control.

**Intelligent Protection**

The intelligent protection concept automatically manages compliance patterns and constraints as well as non-Boundary Scan structures for test/ISP generation and application without any conflicts. The validity and safety of manually created test vectors as well as the test bus integrity are constantly verified at run-time.

**Intelligent Test Coverage**

The data base concept and intelligent tools together allow for high fault coverage with a limited set of test vectors and pin level diagnosis by combining both Boundary Scan tests and other test techniques. In addition, the innovative principle of a Virtual Scan Pin extends the Boundary Scan coverage.

**Intelligent User Interface**

The intelligent software structure of SYSTEM CASCON™ allows the definition of user accounts and a project oriented work flow (myCASCON). A consistent GUI supports all test and ISP applications and satisfies requirements in lab, production and field service environments. A Floating License provides flexibility for worldwide utilization of the tools.

**SYSTEM CASCON™architecture**

![Diagram of SYSTEM CASCON™architecture](image-url)
One software for all applications

Designed to meet customer demands, the integrated architecture of SYSTEM CASCON™ allows for a flexible custom configuration in four aspects. Göpel electronic offers predefined Packages, Stations and Editions for specific applications. These default configurations can be customized by upgrading and extending them with individual features. The integrated SYSTEM Configuration and Licensing Manager provides the centralized functionality to handle this high degree of modularity and customization, controlled by Software Enable Codes. Existing installations can thus be upgraded at any time, even temporarily. All logistics to automatically handle software updates and upgrades is available worldwide and 24/7 through our customer support website GENESIS.

CASCON GALAXY® configuration matrix

<table>
<thead>
<tr>
<th>Available Packages</th>
<th>CASCON GALAXY® Editions</th>
<th>Test Station (TS) Package</th>
<th>Development Station (DS) Package (TS included)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DS Package</td>
<td>DS Package</td>
</tr>
<tr>
<td>Test Station (TS)</td>
<td></td>
<td>TS Package</td>
<td>TS Package</td>
</tr>
<tr>
<td>Base Edition</td>
<td></td>
<td>TS/DLL Plug-In Package</td>
<td>TS/DLL Plug-In Package</td>
</tr>
<tr>
<td>Classic Edition</td>
<td></td>
<td>DS Package</td>
<td>DS Package</td>
</tr>
<tr>
<td>Advanced Edition</td>
<td></td>
<td>TS Package</td>
<td>TS Package</td>
</tr>
</tbody>
</table>

Test and / or In-System Programming (ISP)

With CASCON GALAXY® and CASCON POLARIS™ two predefined Packages are available. POLARIS™ is configured exclusively for programming FLASH and PLD/FPGA devices, whereas CASCON GALAXY® is designed for both test applications and ISP applications.

Stand-alone in Laboratory or Production, or integrated in other ATE

For all SYSTEM CASCON™ Editions three Stations exist. The Development Station (DS) provides tools for generation and execution of test and ISP procedures. A Test Station (TS) and Execution Station (ES), are used to execute previously developed test and ISP procedures. A Test/Execution Station as DLL (TS/DLL, ES/DLL) can be used to integrate SYSTEM CASCON™ into other ATE.

Complete Tool Suite or Individual Tools

Based on predefined Editions and optional tools, the user can customize the tool box available in SYSTEM CASCON™ to match the specific requirements of his/her application, test strategy and corporate environment. Upgrades are possible by purchasing individual tools or directly from one Edition to the next higher Edition or Package.

Node Locked License or Floating License

A single user license allows one user to work with the tools, even if several user accounts are set up in SYSTEM CASCON™. Application data can be stored locally or on the network, the location can be defined individually for each user. A Floating License enables the distributed use of the tools throughout the network, as long as the user’s PC is connected to the license server. Multiple licenses can be purchased for complete Editions as well as for individual tools to allow concurrent use by multiple users.

Four aspects to consider to optimize Your SYSTEM CASCON™ configuration

Four aspects to consider to optimize Your SYSTEM CASCON™ configuration

For all SYSTEM CASCON™ Editions four aspects to consider to optimize Your SYSTEM CASCON™ configuration.

1. License type
2. Configuration management
3. System management
4. Distributed use
Determining which Edition to use

Since the extensive modularity of CASCON GALAXY® supports a rather complex mix of various Boundary Scan procedures, one should consider all the aspects (applications to be supported during the product life cycle, licensing, etc.) when determining which Software Edition to use. In general, the tool set requirements rise with the complexity of the UUT as well as with the number of different Boundary Scan designs to be supported. Especially, the effectiveness and accuracy of Automated Test Pattern Generation (ATPG) tools and Pin Fault Diagnosis (PFD) tools play an important role. If new Boundary Scan designs are expected to be tested frequently with the tools in the future, one should consider the increasing complexity of such designs when deciding which Edition to purchase rather than just to look at the immediate requirements.

The Basic Modules are always included in every SYSTEM CASCON™ station. These modules include the Batch Composer, used to generate flexible test strategies for the complete UUT, and the Multi Mode Executor, used to execute individual Test and ISP procedures or complete Batch sequences. Furthermore, tools to handle multiple boards in parallel (Gang Test and Programming) as well as the automated control of Scan Router Devices from semiconductor vendors such as Texas Instruments, National Semiconductor and Firecron are Basic Modules and are included in all software packages.

The interactive Project Inspector provides a consistent Graphical User Interface in SYSTEM CASCON™ for all tasks required for a Boundary Scan project, including the generation of an intelligent UUT data base, the development of all Boundary Scan Test and ISP procedures, and the project data analysis and verification. The Project Inspector provides context sensitive access to all development, execution and diagnostic tools as well as to all input and output files, including test coverage reports.

<table>
<thead>
<tr>
<th>Development Station</th>
<th>Execution Station</th>
<th>Execution Station / DLL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete package for ISP development and execution; suitable for Laboratory and Production preparation</td>
<td>Run-Time package for Infrastructure Test and ISP execution, suitable for Production and Field Service</td>
<td>API package for integration of Infrastructure Test and ISP execution in other ATE and Programming Systems</td>
</tr>
</tbody>
</table>

The interactive Project Inspector provides a consistent Graphical User Interface in SYSTEM CASCON™ for all tasks required for a Boundary Scan project, including the generation of an intelligent UUT data base, the development of all Boundary Scan Test and ISP procedures, and the project data analysis and verification. The Project Inspector provides context sensitive access to all development, execution and diagnostic tools as well as to all input and output files, including test coverage reports.

### Determining which Edition to use

<table>
<thead>
<tr>
<th>Number of designs or test applications to be supported</th>
<th>GALAXY Classic Edition with options</th>
<th>GALAXY Advanced Edition</th>
<th>GALAXY Advanced Edition with options</th>
<th>GALAXY Advanced Edition with options</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Complexity / Intelligence of the Unit Under Test (UUT) Board or Design Complexity?</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
</tr>
</tbody>
</table>

The extensive modularity of CASCON POLARIS™ supports a rather complex mix of various Boundary Scan procedures, one should consider all the aspects (applications to be supported during the product life cycle, licensing, etc.) when determining which Software Edition to use. In general, the tool set requirements rise with the complexity of the UUT as well as with the number of different Boundary Scan designs to be supported. Especially, the effectiveness and accuracy of Automated Test Pattern Generation (ATPG) tools and Pin Fault Diagnosis (PFD) tools play an important role. If new Boundary Scan designs are expected to be tested frequently with the tools in the future, one should consider the increasing complexity of such designs when deciding which Edition to purchase rather than just to look at the immediate requirements.

The Basic Modules are always included in every SYSTEM CASCON™ station. These modules include the Batch Composer, used to generate flexible test strategies for the complete UUT, and the Multi Mode Executor, used to execute individual Test and ISP procedures or complete Batch sequences. Furthermore, tools to handle multiple boards in parallel (Gang Test and Programming) as well as the automated control of Scan Router Devices from semiconductor vendors such as Texas Instruments, National Semiconductor and Firecron are Basic Modules and are included in all software packages.

The interactive Project Inspector provides a consistent Graphical User Interface in SYSTEM CASCON™ for all tasks required for a Boundary Scan project, including the generation of an intelligent UUT data base, the development of all Boundary Scan Test and ISP procedures, and the project data analysis and verification. The Project Inspector provides context sensitive access to all development, execution and diagnostic tools as well as to all input and output files, including test coverage reports.
**Run Time with Advanced Vector Browser**

A quick overview of the test vectors applied with detected faults highlighted if available with the Advanced Vector Browser (AVB). The pin and net level information in the AVB is scalable to allow an overview or in-depth investigation into individual pins and nets. The layout of the report file can be customized using the Report/Log File Generator to adjust the output to match a specific format.

**Scan Vision**

Scan Vision is an interactive Boundary Scan Visualizer for Schematic and Layout, providing Cross-Probing capability and access to a graphical representation of UUT features from various SYSTEM CASCON™ tools such as the Net List Browser, Test Coverage Analyzer, Pin Fault Diagnostics, or the Debugger. Different types of nets and logic levels on pins can be highlighted in various colors as defined by the user. To utilize Scan Vision, optional CAD Reader for schematic and layout are required.

**Debugger**

SYSTEM CASCON’s Multi Mode Debugger supports both interpretative executions of CASLAN programs, as well as interactive debugging. A comprehensive tool set - including, but not limited to, Watch, Break, and Trace functions - provides visibility to Boundary Scan logic and functional states. Test programs can easily be verified and test patterns can be modified at run-time. Both manually written and automatically generated test programs can be debugged.

**Graphical Library**

The graphical Device Library supports both Boundary Scan ICs and non-Boundary Scan components (that have functional descriptions such as FLASH, RAM, Buffer, and other devices). BSDL files can be imported and exported. A graphical editor allows for interactive device model creation. A system library is included in the standard package.
A complete family of Boundary Scan controllers

GÖPEL electronic offers the widest selection of Boundary Scan controllers on the market, supporting all test and ISP applications throughout the complete product life cycle.

All of GÖPEL electronics controllers can connect directly to the UUT without the need of a special pod. The Boundary Scan controllers are offered for a wide variety of hardware platforms both for PC based as well as system based test setups. The controllers are offered in two performance classes: the A-type and B-type controllers mainly differ in the integrated Scan Memory Architecture and programmability of test bus parameters. Test programs and ISP procedures are cross compatible between the different controllers, no recompiling of applications is required.

Especially suitable in production are Boundary Scan controllers for PXI, VXI and GPIB (IEEE488) Bus. For all these hardware platforms A-type and B-type controllers exist. All controllers are fully supported in SYSTEM CASCON™.

Especially suitable in laboratories are Boundary Scan controllers for PCI, USB and Ethernet. PC-Card (PCMCIA) and Parallel Port based controllers provide a great solution for field service applications. All controllers are fully supported in SYSTEM CASCON™.

### Controller types

<table>
<thead>
<tr>
<th>Bus system</th>
<th>Data bus (bit)</th>
<th>Product</th>
<th>Parallel TAPs (Gang TAPs)</th>
<th>Scan Memory architecture</th>
<th>TCK (max.)</th>
<th>TAP I/O level</th>
<th>External TAP synchronisation</th>
<th>Parallel I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS 232</td>
<td>serial</td>
<td>BSE 1149.1-A</td>
<td>2/(8)</td>
<td>Buffer</td>
<td>16 MHz</td>
<td>3.3/5V tol.</td>
<td>✓</td>
<td>32 bit</td>
</tr>
<tr>
<td>RS 232</td>
<td>serial</td>
<td>BSE 1149.1-B</td>
<td>2/(8)</td>
<td>SPACE™</td>
<td>30 MHz</td>
<td>1.8..3.6V tol.</td>
<td>✓</td>
<td>32 bit</td>
</tr>
<tr>
<td>USB</td>
<td>serial</td>
<td>USB 1149.1-A</td>
<td>2/(8)</td>
<td>Buffer</td>
<td>16 MHz</td>
<td>1.8..3.6V/5V tol.</td>
<td>✓</td>
<td>32 bit</td>
</tr>
<tr>
<td>USB</td>
<td>serial</td>
<td>USB 1149.1-B</td>
<td>2/(8)</td>
<td>SPACE™</td>
<td>30 MHz</td>
<td>1.8..3.6V/5V tol.</td>
<td>✓</td>
<td>32 bit</td>
</tr>
<tr>
<td>ETHERNET</td>
<td>serial</td>
<td>LAN 1149.1-B</td>
<td>2/(8)</td>
<td>SPACE™</td>
<td>30 MHz</td>
<td>1.8..3.6V/5V tol.</td>
<td>✓</td>
<td>32 bit</td>
</tr>
<tr>
<td>Parallel Port</td>
<td>8</td>
<td>Scan Booster</td>
<td>1</td>
<td>—</td>
<td>&lt;200 kHz</td>
<td>3.3/5V tol.</td>
<td>—</td>
<td>2 bit</td>
</tr>
<tr>
<td>GPIB (488.2)</td>
<td>8</td>
<td>BSE 1149.1-A</td>
<td>2/(8)</td>
<td>Buffer</td>
<td>16 MHz</td>
<td>3.3/5V tol.</td>
<td>✓</td>
<td>32 bit</td>
</tr>
<tr>
<td>GPIB (488.2)</td>
<td>8</td>
<td>BSE 1149.1-B</td>
<td>2/(8)</td>
<td>SPACE™</td>
<td>30 MHz</td>
<td>1.8..3.6V/5V tol.</td>
<td>✓</td>
<td>32 bit</td>
</tr>
<tr>
<td>PC CARD (II)</td>
<td>16</td>
<td>PCM 1149.1-A</td>
<td>2</td>
<td>Buffer</td>
<td>16 MHz</td>
<td>3.3/5V tol.</td>
<td>✓</td>
<td>32 bit</td>
</tr>
<tr>
<td>PCI 32</td>
<td>PCI 32</td>
<td>PSC 1149.1-A</td>
<td>2/(8)</td>
<td>Buffer</td>
<td>16 MHz</td>
<td>3.3/5V tol.</td>
<td>✓</td>
<td>32 bit</td>
</tr>
<tr>
<td>VXI 32</td>
<td>VXI 32</td>
<td>VSC 1149.1-A</td>
<td>2/(8)</td>
<td>Buffer</td>
<td>16 MHz</td>
<td>1.8..3.6V/5V tol.</td>
<td>✓</td>
<td>32 bit</td>
</tr>
<tr>
<td>PXI 32</td>
<td>PXI 32</td>
<td>VSC 1149.1-B</td>
<td>2/(8)</td>
<td>SPACE™</td>
<td>30 MHz</td>
<td>1.8..3.6V/5V tol.</td>
<td>✓</td>
<td>32 bit</td>
</tr>
<tr>
<td>PXI 32</td>
<td>PXI 32</td>
<td>PXI 1149.1-A</td>
<td>2/(8)</td>
<td>SPACE™</td>
<td>30 MHz</td>
<td>1.8..3.6V/5V tol.</td>
<td>✓</td>
<td>32 bit</td>
</tr>
</tbody>
</table>

### Scan Memory Architecture SPACE™

Even the best software cannot substitute missing hardware performance. In Boundary Scan, high throughput is achievable only with a high serial data transfer rate. Of all Boundary Scan applications, FLASH programming is probably the most demanding when it comes to data throughput. Here, GÖPEL electronic has developed the SPACE™ architecture which allows the continuous execution of data bursts of variable length. In contrast to solutions utilizing linear data buffers or fixed data compression, SPACE™ is more comparable to a programmable serial Micro Sequencer of unlimited depth. In addition to real time response pattern comparison, SPACE™ provides two other important features.

**DUALSCAN** allows synchronous operation of both PIO and TAP for pulse generation and event polling. **ADYCS** compensates for transmission delays on the TDO signal on the UUT or over the test bus cable to allow for test and ISP execution at the maximum TCK-frequency.
Hardware accessories

In addition to Boundary Scan software and controllers, GÖPEL electronic offers a continuously growing family of accessories for simplifying and extending conventional Boundary Scan applications. These accessories together with SYSTEM CASCON™ software allow the setup of efficient and flexible systems for extended Boundary Scan test and programming applications. I/O modules, for example, which act as external Boundary Scan electronic pins, are fully supported in ATPG and automated diagnosis.

CION™, CION-Modules™
The CION™ chip, a product unique to GÖPEL electronic, is a dedicated user configurable Boundary Scan transceiver device. CION-Modules™, providing I/O capabilities to extend the Boundary Scan test coverage, can be built directly into test fixtures.

SCP Modules, Rack, Module Box
A wide variety of digital and mixed-signal I/O modules is available for desktop and rack based setups. The number of test channels can be multiplied by cascading modules and racks.

PXI Modules
The large selection of innovative extension modules for the PXI bus platform includes special Boundary Scan Power Supplies and Digital I/O and Mixed-Signal I/O modules for integration into PXI based ATE systems.

BScan Probe, Multi Mode Probe
The Boundary Scan Probe and Multi Mode Probe are specialized products developed to support the user in debugging tasks. The Multi Mode Probe has a built-in processor and offers the functionality of an Oscilloscope through USB connection to a PC.

Fixtures, Board Grabber
To simplify test access to bus interfaces such as CPCI/PXI, PC CARD and PCI, GÖPEL electronic offers off-the-shelf test fixtures. The Board Grabber provides a universal solution for UUT connection and test point access with an open frame and easily-positioned nail probes.
Boundary Scan throughout the product life cycle

GÖPEL electronic’s innovative products allow the user to utilize Boundary Scan technology in new ways to make it an integral part of the product life cycle and to utilize it in all corporate structures involved in product design, manufacturing and test.

SYSTEM CASCON™, designed as a Boundary Scan Operating System, acts as the backbone for the setup of a complete test and ISP infrastructure based on access through the Test Access Port defined in IEEE 1149.1. No matter whether individual users work with SYSTEM CASCON™ through a node-lock license, a network license or on integrations in other ATE: project data can easily be transferred worldwide. Together with the intelligent system features, this provides for superior productivity of processes such as rapid design validation and prototype verification, management of design changes or firmware upgrades, rapid New Product Introduction (NPI) in production, or creation of mixed test strategies.

Below: Start with the Lab, Production, OEM and Service

In addition to powerful stand-alone test setups, GÖPEL electronic also offers complete test systems with integrated Boundary Scan. The SCANTURY® BScan Prober, SCANTURY® PXI 50xx Series Tester and the OptiCon AOI system family are examples. Complete integration packages are available for all leading Flying Probe Testers and ICT.
Many international companies have fully embraced the benefits of Boundary Scan. They know that a thorough test strategy is needed to determine the correctness of electronic assemblies. Boundary Scan is able to test highly complex boards and guarantees the required test depth.

Lucent Technologies uses Boundary Scan in the development of PCBs. Before the production stage, the boards must go through various development stages and are tested by Boundary Scan several times. Changes necessary to improve coverage will be made at the design stage. Boundary Scan is an integral part of the product philosophy from the very beginning. Time is highly important. Between the device’s development and the series production 2-3 test runs are made. Without using Boundary Scan two additional stages would be required which would mean a delay of 4-6 weeks. Boundary Scan is universally used as part of the board test, and for the programming of EEPROMs, CPLDs and Flashes and verification of components.

Without BScan there would be a growing test gap in respect of highly complex components such as BGAS and µBGAs. Lucent Technologies decided in favour of Boundary Scan from GÖPEL electronic because they are convinced by the product’s quality, a “quality other vendors do not supply.”

Siemens Transportation Systems uses Boundary Scan at the production stage, where products with a very long life cycle are manufactured. They rely on standards, which guarantee the future of the test method.

In 1997, the Siemens engineers learned about Boundary Scan. Safety-relevant boards were not completely accessible with test points for the In-Circuit-structural test with a nail bed adapter. Boundary Scan solved the problem. Today, the method is seen as a technical necessity. Devices, which cannot be tested by ICT, are tested with Boundary Scan from GÖPEL electronic which, in particular, is beneficial for mixed technology PCBs.

Boundary Scan filled the test gap, the ICT leaves, without problems. “Since the trend is moving to ever more complex components, Boundary Scan is irreplaceable”, say the test engineers. “Focussing on it was the right decision.”

The people at Tektronix, Monitoring & Protocol Test share this opinion. They are excited by the extraordinary good support. But that’s not all. Tektronix produces PCBs with very high packing density, double sided packed BGAs and more than 2,000 nets. Traditional test strategies were not able to achieve the necessary test depth anymore because of the lack of test points and the available space.

Boundary Scan was discovered as a reliable test technology. After comparing various suppliers the following were decisive in choosing GÖPEL electronic:

- hardware engineering
- the software development plans
- the high level of support

The range of functions and simple user interface

Besides testing of prototypes already at the development stage, Tektronix uses Boundary Scan in the entire life cycle of their products – for testing and programming. The use of Boundary Scan is especially beneficial in the case of re-designs, because an ICT would require a completely new bed of nails which would mean the loss of time and money.

"From the beginning we were very satisfied. The system has worked reliably. The service and the extended hardware and software are unbeatable”, say the test engineers.

The decision for SYSTEM CASCON™ from GÖPEL electronic was made because of the software structure and the well organized software.
Comprehensive support & service for Your success

As with all new technologies, Boundary Scan is very support intensive in the introductory phase, and we still encounter new possibilities of this exciting approach. GÖPEL electronic and our partners guarantee you extended technical support. As the world-leading provider of intelligent tools for extended Boundary Scan, we have been customer driven since the company’s foundation in 1991. Together with our reliable distribution and support centres, we supply excellent products combined with comprehensive after-sales service and support. This way the vast experience gained from more than 10,000 successful test projects is turned into your individual benefit.

Worldwide support for our global customer base

- GÖPEL electronic corporate offices
- Authorized distributors/VARs
- Authorized support centres

Please find your local distributor on our website at www.goepel.com

Intensive support throughout the entire product life cycle

- Seminars for basic and advanced Boundary Scan (2 day classes)
- In-house seminars with individual agendas
- Hands-on system training (2 day class) as training on the job
- Worldwide Boundary Scan Days® (meetings for users and interested parties)
- Special education package based on Scan Trainer Kit
- Application support via telephone hotline, Email, online (GOEPEL-WebEx portal), downloadable application notes on the GENESIS website and in urgent cases direct contact with development engineers
- Consulting service for Boundary Scan project preparation and Design-For-Testability for ASICs, boards, modules or complete systems
- Test program and fixture generation
- Software updates downloadable from GENESIS
- Customized turn key solutions and new product features upon request
- BSDL verification service
- Testability analysis

On our website www.goepel.com we provide comprehensive information about upcoming Boundary Scan events – also in cooperation with our authorized support centres.

Further information and Your contact

The brochure Boundary Scan Instrumentation Catalog is far more than just a catalog. The history of Boundary Scan as well as advantages and applications are explained in a comprehensive tutorial. Products and services for Boundary Scan from GÖPEL electronic are described in detail. Advice for product selection and the subdivision of the catalog into software, hardware and test accessories simplify the composition of test systems for specific requirements. Additionally, the appendix contains information about seminar outlines for beginners and advanced users as well as support services.

For more information about Boundary Scan product line, please visit our website at: www.goepel.com

Products and services for Boundary Scan from GÖPEL electronic are described in detail. Advice for product selection and the subdivision of the catalog into software, hardware and test accessories simplify the composition of test systems for specific requirements. Additionally, the appendix contains information about seminar outlines for beginners and advanced users as well as support services.

For more information about Boundary Scan product line, please visit our website at: www.goepel.com