



## As the chiefs say



From an initiative 3 years back to a tradition now, The e-newsletter has explored all limits of knowledge. I extend my heartfelt greetings to all participants, authors, faculty staff and students associated in this endeavor.

Er. DC Jain  
Chairman  
(Gyan Ganga Group)



It is a matter of great happiness to me to know that the students have continued the e-newsletter for such a long time with great efficiency. Each edition comes out better than the previous and I have similar hopes from this one.

Mr. Rajneet Jain  
Secretary  
(Gyan Ganga Group)



I am very pleased to know that our college team is coming out with another issue of the e-newsletter. I heartily congratulate the editorial team. We expect to put a lot of technical knowledge to the readers from this e-newsletter.

Mr. Pankaj Goyal  
Executive Director  
(Gyan Ganga Group)



This effort of the students will be surely appreciated by one and all. Along with academics, the different activities in college are the keys that will unlock the hidden talents and thoughts in students.

Mr. Apurva Singhai  
Executive Director  
(Gyan Ganga Group)



It is joyous to know that the students are continuing the legacy of the e-newsletter as it shall help in spreading the activities being conducted by the institute to the public. I wish the team good luck.

Dr. Maneesh Choubey  
Group Director  
(Gyan Ganga Group)



It gives me immense pleasure to know that another edition of Electrikus is coming out. I wish all the success to the team of the EC branch involved and hope that this edition will also benefit the students in a great manner.

Dr. Vinod Kapse  
Principal  
GGITS, Jabalpur



This new edition of Electrikus has lots of exiting updates. Technology and time never stop and the updates here keep account of the latest developments. My warm wishes to the Gyan Ganga Group for the publication of this e-newsletter.

Dr. Preeti Rai  
H.O.D. EC Dept.  
GGITS, Jabalpur



so many incredible issues previously. I congratulate the editors on handling the pressure well and coming out with yet another brilliant edition of Electrikus. We truly are "Committed for Excellence".

Prof. Pankaj Sahu  
Faculty in-charge  
Electrikus

## Editors of this issue

- ◆ DEBTANU MUKHERJEE
- ◆ KAMINI PANDEY
- ◆ MIHIR DATTANI
- ◆ TULIKA BHATTACHARYA

## **VISION**

“To be centre of excellence in teaching-learning and employability in various fields of Electronics and Communication Engineering to produce globally competent, innovative and socially responsible citizen.”



## **Mission**

1. To offer high quality graduate and post graduate programs in Electronics and Communication with strong fundamental knowledge and to prepare students for professional career or higher studies.
2. To foster spirit of innovation and creativity among students, faculty and staff, promote environment of growth, participation in conferences, technical and community services and lifelong learning for all.
3. To discover and disseminate knowledge through learning, teaching, sharing, training, research, engagement and creative expression.



## On the line

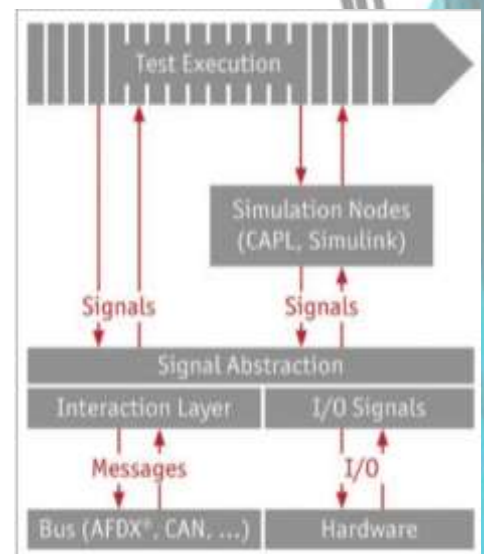
The networking of line-replaceable units is integral to aerospace electronics. A new system is becoming a widely used tool for analysis, simulation, and testing of distributed, embedded system.

Over the past several years, the importance ascribed to aerospace electronics has changed fundamentally. Initially, just a few line-replaceable units (LRUs) were used in aircraft, but innovations were soon increasingly based on electronics, and predominated by a share of functionality residing in software and functional integration. This rising complexity means that extensive, reproducible and effective tests are more important than ever in all phases of LRU and system development. The widespread use of numerous electronic components causes the number of potential error sources to grow disproportionately. Some weaknesses of the overall system are not revealed until the components are integrated under real conditions during aircraft power-up. This has made testing an interdisciplinary activity that is practiced across departments, manufacturers, and suppliers. Participants in the aerospace industry have learned lessons from the enormous electronics problems experienced in recent years, and they place great importance on testing. Nonetheless, the complex task of distributed testing can usually be made more reliable by systematic use of available tools.

### ANALYSIS, SIMULATION & TESTING OF LRUs

The networking of LRUs forms the backbone of aerospace electronics. In this environment, CANoe from Stuttgart-based Vector Informatik is a widely used tool for analysis, simulation, and testing of distributed, embedded systems. It is often used to implement a remaining bus simulation, and monitor multiple bus topologies simultaneously, and it supports all significant bus systems –

in particular AFDX/ARINC 664, ARINC 812/825/826 (CAN), IP, and several others. Any combination of supported bus systems can be used synchronized and in parallel from a single test system. Vector also offers multiple I/O hardware products that supplement general options with test specific functions such as the ability to apply electrical loads and short circuits directly to the LRU ports or simply to monitor and stimulate discrete lines. In addition, commercially available interface cards can be addressed from CANoe. Any standard workplace PC or laptop running under Windows can be used to run CANoe. More powerful test systems with improved real-time capabilities can be set up in a real-time configuration. This approach involves executing the remaining bus simulation and the actual test execution on a dedicated computer under an optimized operating system (Windows XP Embedded), while another dedicated PC is available for the graphic user interface and evaluation. This system configuration can also be used as a test execution environment for a component HIL tester.



### INTEGRATION OF TEST & DEVELOPMENT

Today's development models provide tests in various phases of development. In general, the individual tests are considered self-contained and separate activities. In this context, test creation is often also organized as an independent task, detached from other development activities. This division of work results in a distribution of the many tasks among specialized work groups in the development process. However, if this separation is too strict, the numerous contact points between different development and test tasks cannot be optimally linked. For example, only good coordination between component and system testing can prevent expensive duplicated development of test cases that cover the same content. When compatible tools are used, test cases developed once in the various work areas can serve as the foundation for further developments. Along with linking the various test phases, development

and testing activities should be coordinated with one another. Testing should be understood as an integral part of development. What is important is that the tests should not just be available in the required formal verification phases, but should also support development. Ideally, initial tests could be performed right at the workspace or the LRU developer with the resources available there. For this purpose, CANoe offers a runtime environment for test execution that can be used in parallel with the remaining bus simulation and analysis functions. The remaining bus simulation is an important foundation for the tests. It does not need to be set up manually but should be automatically generated and parameterized from available databases of the system description. The actual work can be performed so-called modeling DLLs deriving from MATLAB/Simulink – for example, the interaction layer or network management, which are supplied with the tool. Standardized interface description documents can also be used for automated scenario setups. The signals that the remaining bus simulation supplies for the simulated nodes can be acquired directly from the test scripts, stimulated or manually operated.

#### MATURITY ASSESSMENT & ERROR ANALYSIS

To assess the maturity level of an LRU during development, all executed tests should be comprehensively evaluated. The quality of the individual test results with regard to reliability and relevance is a key feature of a proper verification process. But it is equally important to ensure that suitable tests are used to achieve broad coverage of the required properties. The results of less formally executed tests are helpful

for a maturity level analysis. A prerequisite for this is consistent reporting on each test execution. In each execution of a test with CANoe, whether it is conducted in the test laboratory or at a work bench, a test report is created. The system generates it without intervention by the operator or test case developer, and it is therefore available without additional effort. The XML format of the reports is an open format, so that the report results are available for further processing by other tools. For example, a test management system could evaluate the reports in the context of a maturity level analysis. To ensure a reliable and traceable integration into common development chains, additional DOORS (dynamic object oriented requirements system) modules are available. These modules generate compatible test reports and ensure bidirectional traceability of requirements, test cases, and their results. At least as important as recording and evaluating the test results is the analysis of the actual error causes. However, most test tools will do this analysis in a rudimentary way at best, partly because error analysis is often considered a separate task, one for developers to do. Developers are initially confronted with the problem of understanding the errors detected in the test and tracing them to their origins. Especially in the case of errors reported by test laboratories, the developer usually does not even have access to the systems used in the test. To enable immediate evaluation of the causes of errors it is vital to obtain a precise log of the test flow and every interaction with the device under test, especially the bus communication. In the context of an analysis, the CANoe user can play back any desired recordings (logs) in order to analyze them offline or to stimulate a network with prerecorded error conditions. It helps if developers have the same type of test system at their workplaces, so that in the event of errors the developer can verify the test cases independent from the aircraft or test bench.

