

# SMALL SCALE SEQUENCE AUTOMATION PAYS BIG DIVIDENDS

## Abstract by Bill Nelson

Galileo sequence design and generation is supported by a suite of formal, "Category A" software tools. Sequence review, however, is largely a manual process with reviewers seaming hundreds of pages of cryptic computer printouts to verify sequence correctness. Only two mainframe based tools, the CHECKER module of SEQGEN and the STRIPPER program supported review.

CHECKER is a hard coded constraint checker which is limited to simple rules and is often out of date. Spurious warnings are common. STRIPPER is a data extractor driven by a fixed, change controlled database that provides only a single strip per subsystem. Arbitrary text data can not be extracted nor can skips be customized for different review items, Computerese can not be reformatted to be more easily understood. Complex checks are unsupported and remain manual.

Beginning, in 1990, a series of small, IT-based sequence review tools evolved. Designed to have a common "look and feel," each tool performs a specific task. The narrow focus of each tool means simpler operation, and easier creation, testing and maintenance.

SKIMX, a user programmable data extractor, will find data with arbitrary text, providing custom skips for every rule or check. Other tools such as SAFPRINT, OPEVENT, and XPN DIA will reformat various sequence products to organize data in more easily understood form. Using multiple passes, outputs may be tailored to each specific need. Reviewers can also use SKIMX to strip subsets of data from the reformatted files. Finally, a series of subsystem specific tools have been developed to perform complex subsystem checks, generally comparison of actual controlled states to predicted maxima or minima.

The benefits of these tools are:

- 1) Decreased review time by factors of 5 to 20 or more. SKIMX alone has cut review times by factors of 2-4. In a test, OUTCHK, one of the subsystem review tools, decreased review time from 14 hours 1012 minutes.
- 2) Increased review accuracy by reducing the manual, repetitive work. The test of OUTCHK not only illustrated dramatic time savings but also uncovered three errors missed by the manual review. Prior to the creation of the SAFPRINT suite of tools, timing and logical errors in the Station Allocation File (SAF) were common and costly to fix. Since using the SAFPRINT suite of tools, no SAF file has experienced any timing or logical errors.
- 3) Excellent returns on time invested because the tools were unburdened by the documentation and change control requirements of Category A software. To date, fewer than 80 hours have been invested in SKIMX while it has saved over 1000 hours of review time.

None of these tools alter any sequence products. None makes decisions; that is left to the reviewers who continue to have full responsibility for verifying sequence correctness. But by finding and organizing data, by presenting it in easily understood ways, and by performing rote logical tests and checks, these tools have dramatically reduced the time and effort required for sequence review while increasing the accuracy of this formerly manual process.

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