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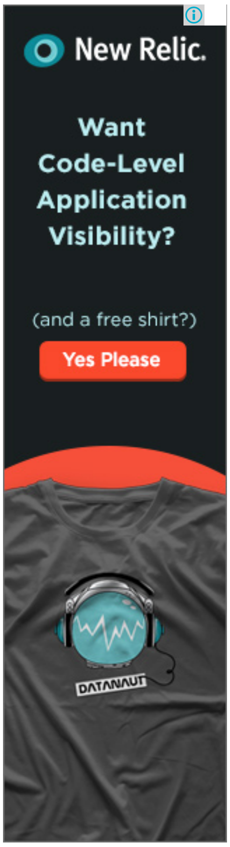

Turbo Pascal Internals

Turbo Pascal compiler functions are grouped into several categories/units according to their role in the compiler. This grouping is done only to have a better overview on the individual parts of the compiler. On the other hand, functions from one group usually share common types and variables and therefore it makes sense to place them in separate units.

Basic facts about Turbo Pascal

Unit files in Turbo Pascal (tpu extension) are actually **symbol tables** that are **compacted** and **saved** as individual files. The **System unit** is implicitly used in every program or unit. It contains the boot-strap symbol table and compiler procedures. The definition order of these compiler procedures is important because compiler calls them by id number. To compile **System unit** you need bootstrap symbol table (SYSTEM.TPS).

Boot-strap symbol table contains **system types** like Byte, Char, Boolean, port identifiers, memory identifiers, system functions and system procedures.

Turbo Pascal library (extension tpl) is simple binary concatenation of one or more units. It is loaded at the compiler start. It should contain at least the system unit. You can create unit with console command copy:

```
copy /b  system.tpu  unit1.tpu  unit2.tpu  turbo.tpl
```

Turbo Pascal uses low-level **intermediate code**. Each record can contain target instruction with reference data, intermediate code instruction for subroutines or special meta instruction.

Turbo Pascal relies heavily on the **segment:offset** architecture of the x86 family in the real mode. In many cases this is a limiting factor because many data structures are limited to 64 KB. But on the other hand this comes very convenient when dealing with addresses and offsets.

Compiler
Here is located the main program, common variables, and everything else that does not belong into other categories.

Scanner
Scanner contains functions that processes source files, **extracts tokens** and processes compiler directives.

Symbol Tables
ymbol tables are core part of every compiler. Turbo Pascal uses linked lists and hasing to effectively store and retrieve identifiers. Functions in this unit take care for data storing, identifier searching and various symbol table management.

Parser
Parser processes main program and units, checks syntax, processes stream of tokens and generates intermediate code. This is where the core compiler functions are located.

Expressions
Expression in Turbo Pascal is everything from constant, variable, calculation or just identifier. This unit contains over 100 functions to process every possible Turbo Pascal expression.

Calculator
This unit is used by the Expressions unit and contains functions that process calculations with one or two operands and calculation operation. This unit actually generates code for addition, subtraction, multiplication, division, shifts, etc.

Statements
This unit contains files that process each Pascal statement: If, While, For, Repeat, Case, With, GoTo, Inline, Asm block, or system procedure.

Assembler
Assembler unit processes assembly instuctions in the Asm-end block and generates code for them.

System Functions
This is another unit that is used by the Expressions unit which processes system functions like **Abs**, **UpCase**, **Sqr**, **Succ**, **Pred**, etc.

System Procedures
This unit contains functions to process system procedures like Write, Writeln, Assign, Dispose, Delete, etc.

Type Definitions
Type definitions unit defines data structures for basic types and contains few functions to process type definitions.

Object Files
This unit imports and processes object files and generates intermediate code for OMF records.

Code Generator
This unit processes intermediate code and generates executable code and reference records for Linker.

Linker

Linker joins code from all used units, determines addresses of variables, functions and procedures, resolves references and generates executable file.

I/O Utilities

Turbo Pascal contains many functions that read or write files, handle error messages and take care for compiler operation.

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