HANDS-ON SOFTWARE REVIEW

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Software Tool Eliminates MCU I/O-Pin Conflicts

An MCU selection tool spots pin conflicts and homes in on the critical functions you need

The hunt for a microcontroller (MCU) can take a tortuous path because although you find the "right" MCU along the way, you discover its UARTs share I/O pins with the I2C ports and ADC inputs you need. Engineers often encounter this shared-pin problem far down the selection trail, which means a lot of backtracking. If this hike sounds familiar, take heart, the GOPHER™ software from GruntWare simplifies the selection process. At the start of an MCU search it identifies pin conflicts and helps engineers avoid them. It also lets users narrow a search by choosing from among 130 criteria such as MCU clock frequency, quantities of memory, temperature range, ADC resolution and so on.

Richard Hully, the president of GruntWare, has pulled together a massive amount of information for more than 14,000 MCUs from 21 vendors. The version of the software I used included: Analog Devices, Atmel, Freescale, Luminary Micro, Texas Instruments, Silicon Labs, Renesas and other companies. Hully has "normalized" all of the information to provide consistency. Temperature ranges, for example, are all in degrees Celsius.

I found the software easy to use, and recommend it to anyone who must wrestle with MCU choices, particularly those that involve potential I/O pin conflicts. Today, that includes almost every MCU chip. The GOPHER™ software costs $300 (download) or $340 (CD-ROM and printed manual). GruntWare provides a 48-page manual for GOPHER™ that you can download from the company's website to learn more about how the program works. When you need to choose an MCU that meets many requirements, the GOPHER™ software will quickly pay for itself in saved time and fewer tears. I highly recommend it.

When you start GOPHER™, you'll see a screen that lets you select the vendor or vendors you want to include in your search. I ran tests on one vendor, several vendors and all vendors. If you choose a single vendor, you can opt to search within one of that vendor's MCU product lines or within all

its product lines. When I selected Renesas, I could search for MCUs only in the M16C family, for example.

After you select the vendors to use in searches, you move to the "Pre-Conditions" screen that lets you select pin-sharing conditions that could cause problems. The GOPHER™ software uses this information in an attempt to eliminate the assignment of an MCU's I/O pins to more than one function.

Hully explained that some MCU vendors assign more than two functions to an I/O pin and the GOPHER™ software might not catch a conflict with this type of assignment. Also, GOPHER™ assumes if you assign a pin to a UART, it will remain a UART pin throughout your application. Reassigning pin functions in firmware isn't a good idea anyway. The GruntWare website lists the manufacturers in the GOPHER™ database and notes whether or not the shared-pin analysis is available. (Go to Product Status on the GruntWare website).

To start my test of the software, I selected all MCU vendors and then on the Pre-Conditions display, I chose four ADC-input pins and six general-purpose I/O (GPIO) pins, exclusive of the four pins already assigned to the ADC. Hully recommends users begin with as few pin-sharing conditions as possible. Later they can go back and test other shared-pin configurations. When I first tried the software and used five pin-sharing settings, the GOPHER™ search came up empty. It found no MCUs that met my overly restrictive needs.

After I set the ADC and GPIO pin-sharing preconditions noted above, the software produced a screen that let me set any of the 130 parameters in GOPHER™'s database. This screen shows the previously set pin-sharing conditions in gray, which means you cannot change them here, but you can easily go back to the previous screen to do so. GOPHER™ will not lose information as you move between data-entry and search-results information, and it will save search criteria and results for later use.

I didn't enter any additional parameter data, so GOPHER™ found more than 9,000 MCUs that met my ADC and GPIO pin requirements. The results noted I should refine my search to fewer than 1,500 parts. Good idea.

I entered parameters for an 8-bit CPU (=8) and a maximum operating temperature of 125C (=125), which produced more than 600 MCUs. Next, I asked for a real-time clock (=Y) and at least two timers (>=2). The results listed 206 parts, a more manageable list that included Freescale and STMicroelectronics MCUs. I noticed some MCUs listed as Future or Upgraded, but I wanted

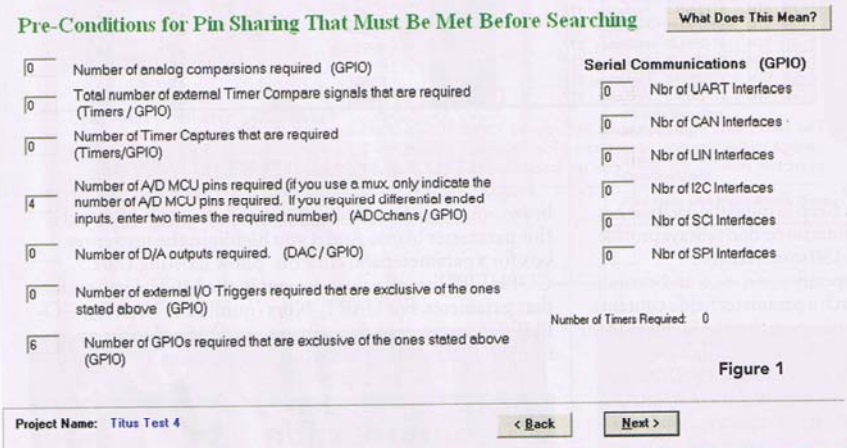

Figure 1

GOPHER™'s Pre-Condition screen lets users select the functions and numbers of pins they require so the software can search its extensive database of MCUs for devices that avoid pin conflicts.

only devices in production. Inserting [Prod in the Status box dropped the list to 198 MCUs. When I specified on-chip debug capabilities, GOPHER™ listed 24 MCUs, all ST7 CPUs from STMicroelectronics. Very helpful.

The parameter-entry format allows for many conditions that greatly improve search results and reduce wasted time. Specifying exactly two timers (=2) rather than two or more timers (>=2) can unnecessarily constrain preliminary searches that look for only those MCUs with two timers, even though an MCU with, say, three or four timers would work just as well. I found it better to start with broad search criteria and then narrow my search by reducing the criteria to fewer conditions or possibilities. Keep in mind the database has some "empty" cells because manufacturers don't always provide information for every one of the 130 search criteria.

Parameter searches let users specify =, >=, <=, > and < conditions. In addition, users can search a parameter field's contents for information. The [Prod notation searches the Status field for the occurrence of "Prod," as in Production. Gopher also provides a NOT operator, ', so the search criterion '[BGA means, "Find parts that do not include BGA in the Package field."

Don't worry if you don't understand what a parameter means. Put the cursor on the parameter name and GOPHER™ spells out the full name and allowable options. Mouse over BOR, for example, and GOPHER™ notes it's the brown-out reset function and you can choose Y, N or leave this parameter blank. And if you highlight the text-entry box for a parameter and click on "Show Existing Data," GOPHER™ lists all values present in the MCU database for that parameter. For UART_Nbrs (number of UARTs), GOPHER™ reports zero through nine and Y. So, don't expect to find an MCU with 13 UARTs in the database.

Figure 2

24 Parts Found | Hide Columns | Hide Blank Columns | Un-Hide | Search

	Vendor	PartNbr	Status	CPU	CPU_Size	MCU_Freq	RAM	FROM	PROM	EROM	MROM	Sply_V_Min	Sply_V_Max	Oper
1	STM	ST72324BJ2	Production	ST7	8	8	384	8192				3.8	5.5	
2	STM	ST72324BJ4	Production	ST7	8	8	512	16384				3.8	5.5	
3	STM	ST72324BJ6	Production	ST7	8	8		32768				3.8	5.5	
4	STM	ST72324BK2	Production	ST7	8	8	384	8192				3.8	5.5	
5	STM	ST72324BK4	Production	ST7	8	8	512	16384				3.8	5.5	
6	STM	ST72324BK6	Production	ST7	8	8		32768				3.8	5.5	
7	STM	ST7232AJ1	Production	ST7	8	8	384				4096	3.8	5.5	
8	STM	ST7232AJ2	Production	ST7	8	8	384				8192	3.8	5.5	
9	STM	ST7232AK1	Production	ST7	8	8	384				4096	3.8	5.5	
10	STM	ST7232AK2	Production	ST7	8	8	384				8192	3.8	5.5	
11	STM	ST72334J2	Production	ST7	8	8	384	8192				3.2	5.5	
12	STM	ST72334J4	Production	ST7	8	8	512	16384				3.2	5.5	
13	STM	ST72334N4	Production	ST7	8	8	512	16384				3.2	5.5	
14	STM	ST72361J6	Production	ST7	8	8		32768				4.5	5.5	
15	STM	ST72361J7	Production	ST7	8	8		49152				4.5	5.5	
16	STM	ST72361J9	Production	ST7	8	8		61440				4.5	5.5	
17	STM	ST72361K6	Production	ST7	8	8		32768				4.5	5.5	
18	STM	ST72361K7	Production	ST7	8	8		49152				4.5	5.5	
19	STM	ST72361K9	Production	ST7	8	8		61440				4.5	5.5	
20	STM	ST72561J4	Production	ST7	8	8	1024	16384				4.5	5.5	
21	STM	ST72561J6	Production	ST7	8	8		32768				4.5	5.5	
22	STM	ST72561J9	Production	ST7	8	8		61440				4.5	5.5	
23	STM	ST72561K6	Production	ST7	8	8		32768				4.5	5.5	
24	STM	ST72561K9	Production	ST7	8	8		61440				4.5	5.5	

The GOPHER™ search results include all 130 device parameters for the 24 parts that met my design requirements. Users can hide columns, search for information within the results and print the results. Or they can go back and change search criteria.

For More information

GruntWare Inc.'s GOPHER™ Software:
http://designnews.hotims.com/23107-572