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**gumstix, inc. white paper
“a one year report”**

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On May 14, 2004, innovative startup gumstix, inc. released two computer boards: the gumstix™ computer models 200x and 400x. Each board was the size of a stick of gum and weighed less than a tablespoon of water. gumstix also shipped two computers, the waysmall™ computer models 200x and 400x. All products were based on the Intel® PXA-255 processor with Xscale technology and addressed the markets need for high function, low cost development and production platforms.

In this first year, gumstix achieved significant milestones in product engineering and in supporting its community of customers. A second gumstix platform was launched along with several new expansion boards for testing and development as well as for wired and wireless connectivity. The highly functional software development environment has become a key attraction to design engineers and Linux developers in business, education and hobby locations around the world. The strong user group that has formed around the company demonstrates the excitement about gumstix and its innovative products.

“We find ourselves at a key point in our company history”, states Gordon Kruberg, Founder and CEO of gumstix, inc. “Our customers are in the prototype, business case and early product stages of a very wide range of applications. From enhancing existing product lines to adding new function such as RFID, sensor management, control panels, personnel management devices, reading tablets, network security, software appliances, robotics, UAV and many more areas of engineering and business, the gumstix platforms are providing key marketing and price/performance advantages”.

Kruberg praises the gumstix user group that formed over the past year. Using online collaboration that reaches around the world, this active community of users asks questions, shares answers and generates solutions. The gumstix user group includes experienced design engineers and Linux programmers as well as neophytes who are just starting out.

“Our customers and their user group drove many of this year’s innovations,” Kruberg states. Smiling, he continues. “They aided us in our product planning and engineering, and help us from making mistakes as we go forward in the various product lines and software development.”

gumstix and its customers’ engineers made, or assisted in making, key linux kernel and linux driver advancements including:

- Advancement of the linux USB gadget driver development on the gumstix platform, ensuring that linux PXA-255 devices can communicate properly using RNDIS with windows, or CDC ethernet to linux hosts to provide plug-and-play USB networking to host devices;
- Customers contributing changes to the linux kernel enabling a gumstix to be used with a Wifi CF card as a wireless access point (not merely a wifi client node)...
- Fixing critical bugs in the linux PXA-255 serial port code allowing full use of the PXA UARTS at 921,600 bps;
- On-going development of the first port of bluetooth audio profiles for linux to the PXA-255, enabling use of a bluetooth headset for audio in/out of linux applications;

These changes have enhanced the ever-increasing hardware function developed by gumstix hardware engineering. For expansion board connectivity, the gumstix basix platform now uses a 60-pin Hirose connector while the new gumstix connex platform has both the 60-pin Hirose connector and a 92-pin bus header. The gumstix product lines have expansion boards that include audio, breakout, usb-powered, compact flash (Wifi and storage), 10/100 ethernet, RS-232 serial, usb client function and a development tweener. An expansion board designed specifically for robotics is in final development. The robostix™ expansion board will be produced after multiple design iterations with the user group. The new name fits in with the rest of the company’s “stix” product lines.

Customers are speaking out about the software as well. “It’s all about the software,” said Mark Gross of Portland, Oregon. “The reason I got my gumstix was the existing software stack, modern Linux kernel and tool chain, working root file system, user community...The gumstix tool chain / kernel and root filesystem running as a source forge deal + the active mailing list”.

Last year, gumstix reported that the installed software included a "Busybox" implementation with web server that enables users to establish a network connection over any of the USB or serial ports. The gumstix platforms also come with a complete Linux kernel and a cross-compiler that lets developers build applications on a host PC and then load them on the gumstix platforms or the waysmall computers.

The gumstix software development kit has expanded to include packages for over one hundred (100) useful Linux tools, including:

- Bonjour (Rendezvous) support for ad-hoc networking
- compression/encryption tools
- firewall, intrusion detection and VPN tools
- network analysis and router tools
- database and file processing tools
- compilers and other dev/debug tools
- wireless: bluetooth and wifi tools
- gps support and audio tools
- SSH and related clients/servers
- web browsers and X windows

All code is open-source linux with no cost for the gumstix development environment. It is freely available online for downloading. Many users begin developing for a gumstix computer before actually purchasing one.

gumstix created a truly collaborative development environment and provides write access to the software repository, thereby giving every gumstix user the ability to contribute extensions to the gumstix dev kit. Users who extend the Linux kernel with new features, or port new applications to the platform, can easily make those changes available to the rest of the community. Most recently, users have contributed enhancements to allow the toolkit to run on OSX machines, allowing Intel PXA-255 packages to be generated on the Mac.

Today, gumstix computers connect to a network in many ways; over any USB or serial port, by using TCP/IP over a bluetooth protocol service called PAN (or personal area network), with 10/100 ethernet or via WiFi. These options show how the gumstix are designed to be very flexible and extensible. This ease of use continues for programming. Most programmers now plug their gumstix computers directly into their Windows machines and the vast majority of Linux x86 applications should be able to be ported to the gumstix environment with just a few days work.

"I got three software loads done in only about 10 days, so I'm ecstatic about the product!" reports Mark G. Carey of Solcore in Columbus, Ohio. referring to 3 network-centric applications. His applications, originally written for x86, were recompiled and run on the gumstix. "It's got enough RAM, and FLASH to make it easy to boot/load programs designed for what were originally much larger platforms (i.e. a standard i80368 computer). I've been doing application development for more than fifteen years and this is as good as it gets".

Craig Hughes, the CTO of gumstix, inc. strives "to have the best software development environment for Linux on the Intel PXA-255 Xscale Processor available, anywhere". The gumstix development environment is rolled together from a combination of different open source projects producing an easy to use environment in which developers can build compilers, C library, linux kernel, and userspace applications extremely easily. The open-source developer model is leading to rapid innovation on the platform.

About gumstix

gumstix develops and sells small, inexpensive, high performance, Full Function Miniature Computers (FFMC). Built on an open source platform, the award winning gumstix product line supports the growing Linux devices market and offers motherboards, expansion boards and waysmall computers. The company sells directly to commercial users, designers, and open source enthusiasts in the embedded, wired and wireless devices, and application-server markets.

Based near Palo Alto, California, gumstix is privately owned and operated. For more information visit www.gumstix.com.

**gumstix:
full-function miniature computers
that drive high function, low cost solutions
for linux developers.**