



Features

- Open source Linux operating system, tools and development environment based on Linux 2.6 kernel technology, ported and optimized for ARM and ST40-based platforms.
- Full set of drivers for basic system devices. STLinux is compatible with higher level driver sets such as the STAPI and STKPI drivers for A/V.
- Full C and C++ toolsets, based on GNU compiler technology, for both native and cross development from x86 Linux PCs.
- Full root file system with over 600 packages.
- Das U-Boot boot loader for boot from Flash deployment.
- On-line network update management (based on “yum”) keeps your installation up to date with the latest STLinux releases and updates.
- On-line support and STLinux training courses available
- STLinux software can be downloaded free of charge from the STLinux website www.stlinux.com

Description

The STLinux 2.4 distribution and development environment provides all the software required to build Linux-based systems for ST-based platforms with an ARM or ST40 embedded processor.

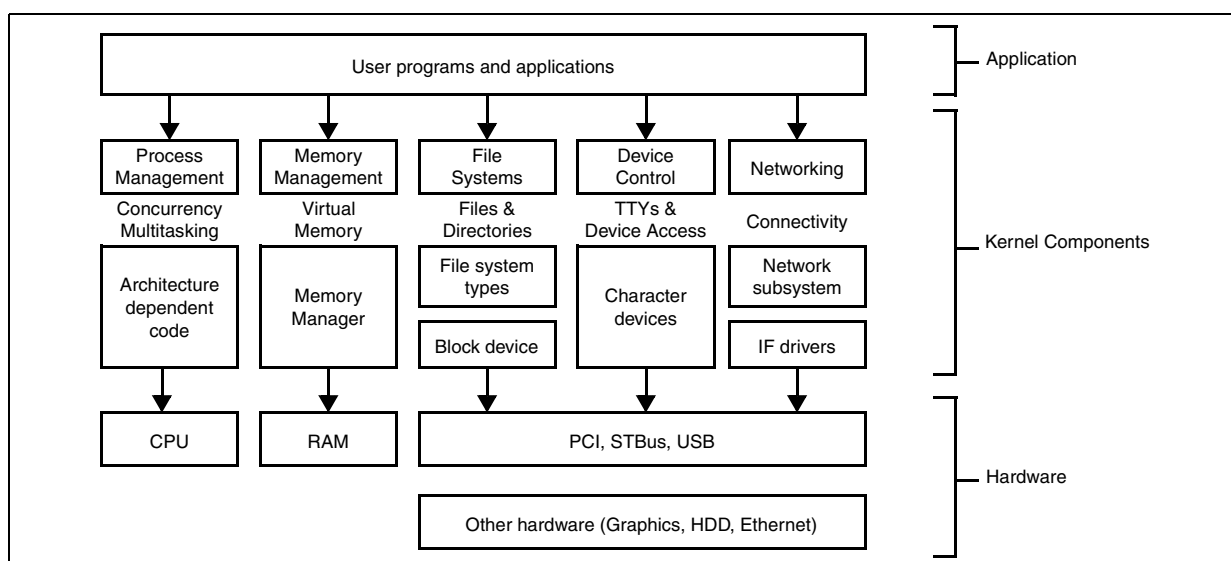
The kernel can be ported to customer boards or used directly on ST reference platforms.

STLinux is open source, the majority is delivered in both binary and source form, making it easy to extend and enhance its capabilities for your specific platform.

New kernel-space code (such as additional device drivers) can be added. User-space applications, written in ANSI C or C++, can take advantage of the application level APIs provided by Linux.

A powerful set of cross-development tools make development easy. The tools include state-of-the-art system analysis and trace tools.

During development, STLinux supports a convenient network-based paradigm using ST Micro Connect to download the kernel, and also using NFS to mount the root file system.



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1 Introduction

STLinux 2.4 provides the ARM and ST40 targeted variants of the STLinux range of Linux Distribution and Development Environments (LDDE). These LDDE systems comprise:

- a Linux kernel based on the open source Linux 2.6 technology
 - Board Support Packages (BSPs) for a wide range of ARM and ST40 reference platforms
 - device drivers for on-chip and board-level devices
- GNU code development tools for both cross development and native development
 - hosted on x86 Linux PC or natively on target Linux platform
 - GNU C and C++ compilers for ARM and ST40
 - full **glibc** and reduced footprint **uclibc** C run-time libraries, with NPTL support
 - GNU assembler, linker and other binary utilities
 - GNU GDB user application debugger
 - kernel aware GNU GDB cross-debugger interfaced to the target through ST Micro Connect^(a) using ST TargetPack technology
- dynamic kernel download tool
 - ST Micro Connect-based JTAG kernel loader
 - download and run STLinux, passing kernel boot-time parameters from host
 - integrated with kernel-aware GDB debugger to debug downloaded kernel through JTAG
- Das U-Boot boot loader
 - download kernel and file system images to the target over either Ethernet or USB
 - manage on-board NOR, NAND and SPI Flash resources for storing environmental data, kernel images, file system images, and so forth
 - boot from Flash, boot over network, and so forth
- advanced system analysis and trace tools
 - based upon dynamic kernel probes inserted at run-time to trace kernel events
 - low-overhead, capable of tracing an STB type system while it performs a normal A/V decode with minimal interfering in application function
- STWorkbench IDE
 - based on the Eclipse IDE and compatible with STWorkbench products for other ST toolsets.
 - powerful source navigation and editing tools
 - fully integrated with STLinux debug and trace tools
 - ARM and ST40 STLinux specific plug-ins to customize the IDE for configuring, building, downloading, debugging and managing STLinux systems

a. The first ST Micro Connect product was named the “ST Micro Connect”. With the introduction of the “ST Micro Connect 2” and “ST Micro Connect Lite”, it is now known as the “ST Micro Connect 1” and the term “ST Micro Connect” is used to refer to the family of ST Micro Connect devices. The “ST Micro Connect 1” is still supported but can no longer be ordered.

- Linux root file system
 - populated with over 600 packages for ARM and for ST40 to provide a rich workstation-like development environment of tools, libraries, utilities and applications
 - hosted either over NFS or using a variety of file system types on IDE or SATA HDD, USB mass storage, NOR, NAND or SPI Flash, and others
 - provided in both **glibc** and **uclibc**-based variants
 - BusyBox-based shell and basic utilities for low footprint deployment systems
- flexible delivery and support model
 - all software is open source and delivered in both pre-built binary^(b) and source form
 - software delivery managed as large number of individual RPM packages, and both binary and source RPMs are provided automatically
 - **stmyum** network update and installation tool (based on **yum**) to manage ongoing STLinux development under user control
 - on-line documentation and support databases

1.1 Development environment

The STLinux development environment is based upon an x86 architecture Linux PC as the development host.

The primary download and debug connection between the host and the target platform is the JTAG port present on all platforms. This connection uses the ST Micro Connect host target interface. The ST Micro Connect provides a networked solution to allow multiple development hosts to access a target platform.

The ST Micro Connect is connected to the host through an Ethernet network connection and to the target through the JTAG port (using an STMC I/O converter^(c)), or directly using the LVDS cable for boards supporting the LVDS connector.

The **st40load_gdb** and **stlinux_arm_boot** tools load, boot and debug a kernel on a target platform using the ST Micro Connect. The **sh4-linux-gdb** and **armv7-linux-gdb** tools can be used directly to debug a kernel already loaded on a target platform.

When booted, the Linux kernel requires a root file system to provide access to the various user space libraries, applications, utilities and tools needed for its operation.

The STLinux kernel can be configured to acquire its root file system from a number of locations, such as:

- a RAM-based file system, loaded together with the kernel through the ST Micro Connect
- a Flash-based file system burned into the Flash memory on the board
- a disk-based file system on an externally attached IDE or SATA hard disk drive, or a form of USB mass storage device
- a network-based file system mounted using NFS

b. The STLinux kernel and u-boot boot loader are not delivered in binary form. Full sources are provided instead so that these packages can be customized and built for the specific target environment.

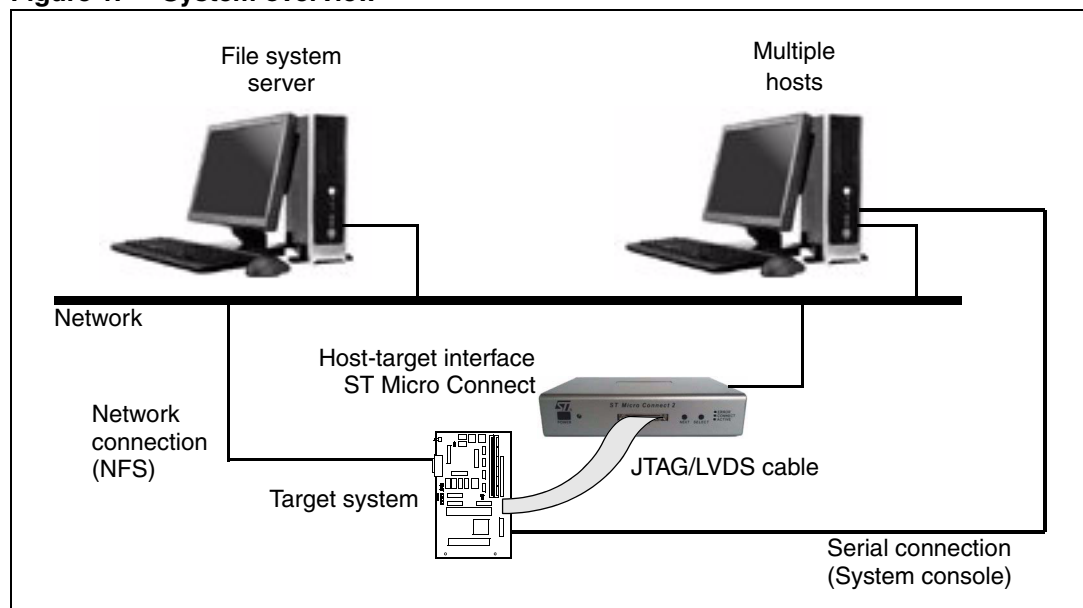
c. For ARM-based reference boards, the STMC I/O convertor Type H is required. For ST40-based boards, the STMC I/O convertor Type A is required.

This last approach is the most flexible during development, because the development host PC can act as the networked fileserver, exporting part of its own file system to the target to become the target's root file system. The contents of the target root file system can then be manipulated easily and directly from the host PC. For this approach, the STLinux kernel must have its networking support configured and a suitable network connection must exist between the target and the host PC network.

Although not essential, it is often convenient to be able to interact with the target's system console from the host system. This is achieved by configuring the STLinux kernel to support the system console by using a serial port on a compatible target platform. A standard null-modem (cross-over) serial cable connects the serial port to one of the serial connections on the host PC. Any host terminal emulation software (for example, Minicom) can then be used to interact with the STLinux system console directly from the host PC.

Figure 1 shows how the various target connections are used in a system.

Figure 1. System overview



In addition to supporting the dynamic download of kernels and root file systems through the ST Micro Connect, the STLinux distribution contains a version of Das U-Boot boot loader. The boot loader itself can be downloaded to the target platform through the ST Micro Connect and burnt into Flash memory on the board so that it runs automatically on platform reset.

Das U-Boot supports the hardware bring-up of the board and can download other images over the serial or Ethernet target connections shown in *Figure 1*. Das U-Boot manages the transfer of these images, such as STLinux kernels, root file system images, and so forth to Flash and on reset can be configured to load the STLinux kernel image to RAM and pass control to it with suitable parameters such that the entire system boots seamlessly and automatically from a board-level reset.

1.2 Supported hosts

The STLinux development environment is based upon an x86 architecture Linux PC as the development host.

The distribution and tools are supported on:

- Red Hat Enterprise Linux v4 and v5
- Red Hat free Fedora (version 8 or later) distributions

In practice, many current x86 Linux PC distributions are usable.

1.3 Supported targets

A wide variety of STMicroelectronics target reference platforms are supported with pre-built binary kernels as part of the distribution. In addition, some selected customer-designed boards are also supported directly.

The kernel is intended to be customizable by the user, and therefore the complete source code is provided, including the standard Linux kernel build scripts. A user can easily modify the kernel configuration using the kernel configuration interfaces, and can rebuild target support for these platforms with new configurations of kernel features and options. For example, this could be done to remove support for unused peripherals or add support for new ones.

With all the kernel sources provided, it is easy for more experienced users to port the kernel to entirely new platforms, such as customer-designed boards that use ARM and ST40-based SoCs. All platform dependencies are isolated in platform support source files, making it straightforward to implement a new Board Support Package for a new platform and to build a new STLinux kernel to support it.

Expert Linux users and kernel developers can modify and extend the kernel itself to meet their own specific needs.

2 STLinux support

Support for the STLinux distribution is provided by the Bugzilla support database, hosted on the bugzilla.stlinux.com website. Users can search the database of existing support requests for relevant information, or submit their own specific support request directly to the STLinux development team. We aim to respond quickly and to resolve most requests in a timely manner.

Before submitting a support request, please read the documentation and other information provided on the main STLinux website at www.stlinux.com, as it is likely that the information you require has already been provided.

3 Additional information

The minimum host system requirements for STLINUX are as follows:

- 1 GHz processor (2 GHz recommended)
- 512 Mbyte RAM (2 Gbyte recommended)
- a supported Linux x86 distribution (see [Section 1.2 on page 6](#))

Note: In order to run STWorkbench, the Oracle Java Runtime Environment 6.0 or an equivalent OpenJDK is required. No other JVMs are supported, and using earlier versions will prevent STWorkbench working correctly.

3.1 System interface

The toolset operates in conjunction with the host-target interfaces listed in [Table 1](#).

Table 1. Host-target interfaces

Description	Connection type	Order code
ST Micro Connect 1	20-way TTL JTAG interface	None ⁽¹⁾
ST Micro Connect 2 with STMC I/O convertor Type A.	20-way TTL JTAG interface	STMC2-40/200
ST Micro Connect 2 with STMC I/O convertor Type H ⁽²⁾ .	MIPI-34 JTAG and STM interface	STMC2-TYPEH
ST Micro Connect Lite with both Type A and Type J connectors.	20-way TTL JTAG interface and 10-way TTL JTAG interface	STMCLite-TypeA

1. The ST Micro Connect 1 is a legacy product that can no longer be ordered.

2. The Type H I/O convertor can also be ordered separately, the order code is TypeH-IO.

For more information about the ST Micro Connect 2, see the *ST Micro Connect 2 data brief* (8161370) and for more information about the ST Micro Connect Lite, see the *ST Micro Connect Lite data brief* (8298299).

3.2 Acknowledgements

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4 Revision history

Table 2. Document revision history

Date	Revision	Changes
4-Sep-2008	A	Initial release.
07-Feb-2012	2	Updated throughout for STLinux 2.4 which supports both ARM and ST40 application processors. Added new order numbers for STMC2 and STMCLite to Chapter 3: Additional information on page 8 . Removed chapters: <i>STLinux kernel</i> , <i>STLinux tools</i> , <i>STLinux root file system</i> and <i>Das U-Boot boot loader</i> . This information can be found on www.stlinux.com .

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