



Carrier Grade Express

data sheet

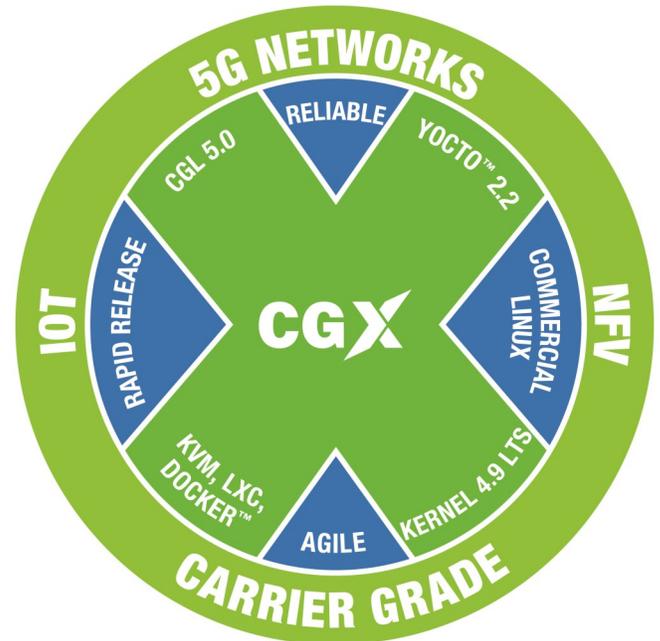
# MontaVista Carrier Grade Express

## Powerful Linux® Environment for Intelligent Devices

MontaVista® Linux® Carrier Grade eXpress (CGX), delivers Carrier Grade Linux reliability, security, and serviceability to embedded Internet of Things (IoT) devices along with high configurability and flexibility.

CGX meets the demands of the interconnected intelligent devices, providing application portability, dynamic configuration, field maintenance, and real-time performance in a single platform. Development teams are under tremendous pressure to build leading-edge features into the next generation of highly intelligent and interconnected devices, while getting them to market rapidly. CGX is the ideal platform for developers who want to leverage the flexibility of a true open source development platform, as well as the ability to achieve rapid time to market.

MontaVista® CGX enables state-of-art development across a wide array of intelligent devices, from traditional 5G networking and communication to Network Function Virtualization (NFV), general embedded and industrial control to Internet of Things (IoT). As a fully integrated, pre-tested environment, CGX offers a truly robust out of box experience for development teams.



### Rapid Release

MontaVista® CGX will follow rapid release cadence to better align with latest Yocto® releases, enabling adoption of newer Long Term Support (LTS) Kernels and Tool-chains.

### Reliable

MontaVista® CGX offers “Carrier Grade” quality enhancements of “High Availability”, “Security”, “Rich Networking and IO support”, “Real-Time response time with high throughput” and “Multicore & Virtualization support”.

### Agile

MontaVista® CGX enables rapid development using QEMU simulator, flexible Import Custom packages, Real-time, Power Management, Memory Footprint Optimizations, and Deep Connectivity.

### Commercial

Developers can leverage MontaVista® CGX rich productivity tools, intensive testing and bug fixes to deliver proven quality for commercial products. Consistent updates, training, technical support, custom engineering, along with access to GPL legal expertise, and export compliance make CGX a full featured platform solution.

## BENEFITS

- Powerful Linux Environment delivers carrier grade Linux reliability, security and serviceability to 5G Networks, NFV, Internet of Things (IoT) devices
- Rapid Release Cadence
- Alignment with latest revisions of Yocto® Project releases
- A non-unified kernel approach, to reduce productization cost and release cadence
- Real Time / Deterministic Kernel, Low Footprint Configuration, Power Management & Fast boot
- Agile development with QEMU Simulator, Secure Builds, and Flexible Configuration
- Latest 4.9 Long Term Support (LTS) Linux kernel
- Pre-built cross architecture BSPs based on ARM@v7/v8 & Intel@ X86 64 (Power PC and MIPS as per roadmap)
- Carrier Grade : High Availability, Serviceability, Long Term Support
- Virtualization: Linux Containers (LXC), Docker™, & KVM
- Eclipse-based IDE (DevRocket™)

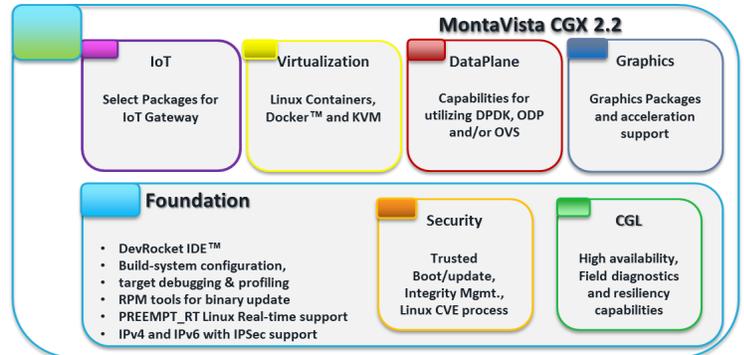
# MontaVista Carrier Grade Express

## Comprehensive Development Platform MontaVista CGX Profiles

MontaVista® Linux® Carrier Grade eXpress (CGX), delivers a comprehensive platform meeting developers need of a truly open solution for higher control that is fully tested for reduced time to market. MontaVista also provides risk mitigation by providing its customers with protection from IP and patent infringement and will provide full US export registration coverage for CGX.

- Linux Board Support with latest Linux 4.9 or higher LTS Kernel version with Pre-integrated OE user-land.
- Software Development Kit that includes latest Yocto™ latest release with GNU toolchains and DevRocket™ Eclipse IDE.
- MontaVista Zone secure content repository

MontaVista CGX is packaged as a base platform (called CGX Foundation) equipped with a core feature set needed to produce a high quality embedded product. For market specific requirements, MontaVista will offer additional technology profiles such as Carrier Grade and Virtualization, which will add key features and functionality critical for solutions in these verticals.

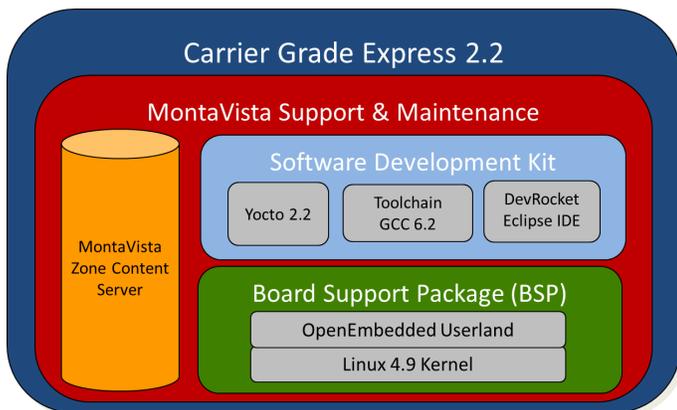
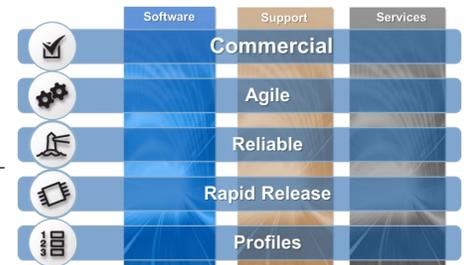


CGX BSP enablement is based on profiles that will be enabled depending on the target market of the board/SoC. Customers can optimize value by selecting to subscribe only required profiles for a particular BSP.

## MontaVista Support & Professional Services

In addition to the technical values, MontaVista CGX users benefit from MontaVista's global support organization that can also provide customized support programs for all customer needs. This is complemented by MontaVista's world-class Engineering Services group to assist customers in building solutions to support their specific use cases ranging from portability of legacy applications to scalable KVM implementations with real-time performance.

In addition to the initial solution, the Engineering Services group can build out a full test and validation process and a long-term support and maintenance strategy to suit the requirements of any deployment strategy.



Reduce your total cost of ownership with a fully supported, standardized Linux platform. The "make vs. buy" decision has been resolved: acquiring CGX is the right choice for OEMs to build a device platform, eliminating concerns about reliability, security, upgrades, or patches, and allowing them to focus on core value-added expertise in application development.

## DevRocket™ IDE

MontaVista CGX includes new runtime components that integrate with MontaVista DevRocket, an Eclipse-based IDE with development tools that enhance productivity for both kernel-level and application-level engineers. Integrated memory leak detection, performance profiling, memory usage analysis, and system tracing combine to accelerate system development and maintenance, and increase system availability. MontaVista Image Designer™ GUI simplifies the creation of the smallest and highest performance file-system.

### HIGHLIGHT

#### BOARD SUPPORT PACKAGE (BSP)

EMBEDDED LINUX KERNEL  
DEVICE DRIVERS & LIBRARIES  
USERLAND APPLICATIONS  
CGX PROFILES\*

#### SOFTWARE DEVELOPMENT KIT

LATEST YOCTO BUILD ENGINE  
KERNEL & APPLICATION DEVELOPMENT TOOLS  
SYSTEM MEASUREMENT TOOLS  
DEVICE MANAGEMENT TOOLS

#### MONTAVISTA CONTENT SERVER

ON-DEMAND CODE FETCHING  
NETWORK BINARY CACHE (PRE-BUILT BINARIES)  
LOCAL SOURCE MIRROR  
SECURE BUILD & UPDATES

#### MONTAVISTA DEVROCKET

ECLIPSE-BASED IDE  
PERFORMANCE MONITORING  
PROFILING  
MEMORY LEAK DETECTION  
MEMORY USAGE ANALYSIS  
SYSTEM & APP TRACING

\*PROFILES AVAILABLE AS SUPPORTED BY BSP(S).

# MontaVista Carrier Grade Express

## Multicore Resource Management

MontaVista® CGX, provides multiple options for maximizing the resource utilization of multi-core processors. With both AMP and SMP support, along with new partitioning and virtualization technologies, CGX provides the most flexibility and the highest performance for multi-core applications.

## Microstate Accounting

For the first time in a commercial Linux product, engineers can accurately measure process and thread utilization on a CPU. CGX performs high-resolution process accounting, so applications can be monitored to anticipate and prevent CPU overload situations. This enables engineers to design automated load balancing and graceful protocol degradation using reliable and accurate CPU load numbers. Engineers can accurately monitor and precisely predict CPU loads, increasing the accuracy of worst-case planning, preventing downtime, and reducing the purchase of backup equipment for traffic surges. Older systems report CPU and thread activities based on statistical sampling estimates, which can be very inaccurate, instead of the actual measurement now enabled by microstate accounting. Microstate accounting in CGX will improve the scalability, reliability, and cost of carriers & IOT device networks.

## Flight Recorder

When a system fails today, field engineers must wait until the next failure to investigate the first one. Engineers have no way of gathering enough data about what happened before and during a crash to conduct an effective post-crash diagnosis and take corrective action. CGX includes the new Flight Recorder, which acts like a black box to track and log system history. It keeps a history log containing the scheduled processes and system events which provides much more information than a crash dump snapshot, and is user-extensible for customized tracking.

## Live Kernel Patching

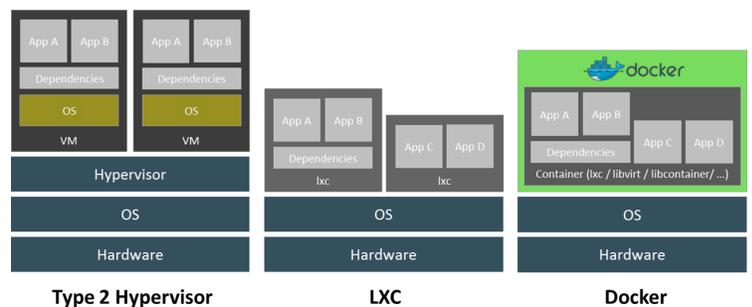
One of the key benefits of the Open Source environment is the speed at which kernel developers respond to security issues. With the addition of Kernel Live Patching system administrators now have the best of both worlds, security fixes can be immediately implemented without any time consuming reboots. In addition to security updates the feature can be used to apply diagnostic patches and critical bug fixes.

## Security

MontaVista has worked closely with the leader in enterprise security to create a platform that meets all relevant requirements for the network enterprise market. Additionally, CGX update leveraged the features applicable to the embedded environment from Security Technology Implementation Guideline (STIG) and Common Criteria Operation System Protection Profile (OSPP) standards to build out the security features for the platform. As a trusted Operating System Vendor, MontaVista receives notification of all security fixes and CGX security team provides rapid updates of any new security fixes to the CGX platform. To help further improve uptime availability, CGX includes native Address Space Layout Randomization (ASLR).

## Kernel Virtual Machine (KVM) Hypervi-

KVM provides a full virtualized environment for hosting multiple guest OS's. KVM allows users to partition the system into multiple OS's with maximum isolation and security. Currently available for all architectures that support KVM.



## Linux Containers (LXC)

Linux containers provide an isolated application space without the need for a complete virtualization solution. They are an operating system-level partitioning method for running multiple isolated processes. Containers do not provide a virtual machine, but rather provides a virtual environment that has its own process and network space allocated which allows CPU time and memory constraints to be set.

## Docker

Docker™ is a project by Docker Inc , initially based on the LXC project to build single application containers. Docker has now developed their own implementation libcontainer that uses kernel container capabilities directly. Designed specifically to support a single application per container.

### HIGHLIGHT

#### VIRTUALIZATION

MULTICORE RESOURCE MGMT  
 KERNEL VIRTUAL MACHINE (KVM)  
 LXC CONTAINERS  
 DOCKER  
 VIRTUALIZATION TOOLS

#### CARRIER GRADE LINUX

HIGH AVAILABILITY  
 FIELD SERVICEABILITY FEATURES  
 ADDITIONAL I/O(IPMI, RAID etc.)  
 CGL 5.0 COMPATIBILITY  
 LONG TERM SUPPPORT (10 Years)

#### SECURITY

SECURE BUILD & UPDATES  
 INTEGRITY MGM. (IMA/EVM)  
 SECURE BOOT  
 FIPS Compliance, STIG &  
 Common Criteria OSPP Std.

#### LINUX BSP & TOOLCHAINS

ARCHITECTURE CROSS TOOLS  
 GCC 6.2 COMPILER & DEBUGGER  
 UCLIBC AND GLIBC SUPPORT  
**DEVELOPMENT HOSTS**  
 LINUX (CentOS6/7, UBUNTU12/14)

# MontaVista Carrier Grade Express

## CGX Solution Themes

MontaVista® CGX is designed for versatility. As an embedded Linux solution it helps developers to deliver next generation devices that range from core networking to the Internet of Things (IoT) Gateways. MontaVista profiles provide flexible building blocks that reduce development time, effort and risk. Here we look closely at some of the leading themes that CGX provides for

### 5G with CGX

**5G Demands - Higher capacity, lowest latency and more consistent experience.**

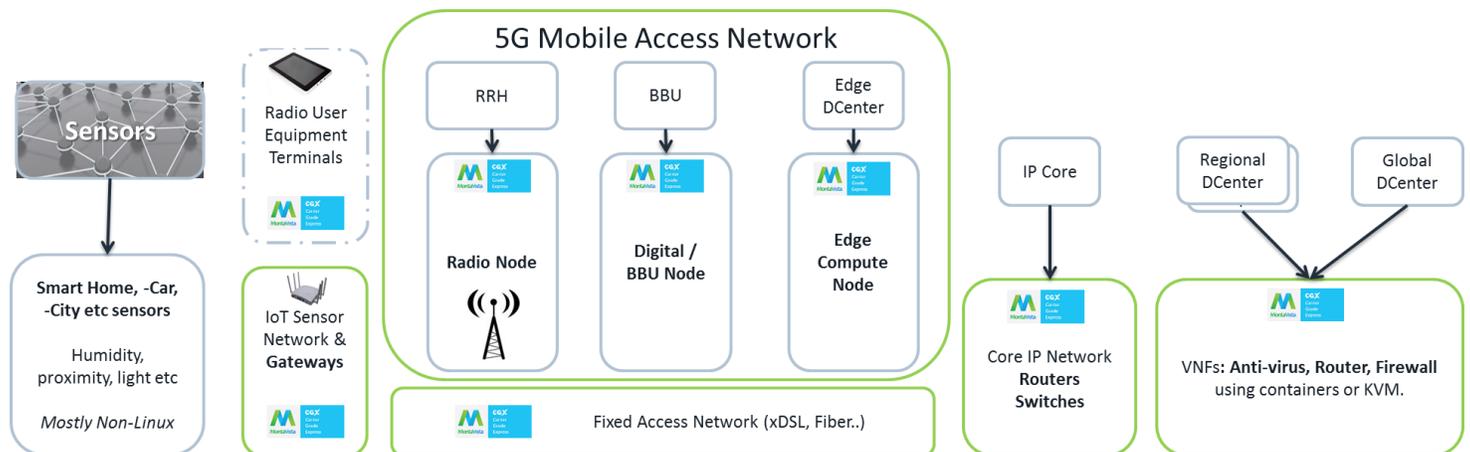
MontaVista continues to participate in the way networks are created and behave. This is important because the next generation 5G networks are not only a new radio but also a framework to deliver 5G applications that require omnipresent scalable service delivery with highest reliability and performance.

MontaVista® CGX IoT profile is designed to deliver feature rich IoT devices, including X11 advanced graphics, JavaVM and Lua Scripting Language. In addition, MontaVista® Professional service engages with our customers to help meet the connectivity, reliability and security requirements of the connected devices markets such as medical, industrial and automotive.

### NFV with CGX

**Carrier Grade Linux for Next Generation Telecom & Network Infrastructure.**

With rapid increase in mobile and IoT traffic NEP's (Network Equipment Providers) are challenged with scaling mobile networks more efficiently than the static networks of the past. Many are looking for a solution where their networks can change on demand.



### IoT with CGX

**Modular and standards-based solution that delivers connectivity, reliably and security needed for IoT systems.**

Internet of Things (IoT) is driving the next wave of the embedded device revolution. From wearables to smart appliances to automobiles, connected devices are being developed today. These devices require a rich set of wired/wireless connectivity options and modular frameworks that can scale rapidly for resource constrained devices with advanced security for data storage and transmission.

CGX meets the demands of the Software Defined Networks (SDN) and Network Function Virtualization (NFV), providing application portability, dynamic configuration, virtualized functions, and real-time performance in a single platform.

MontaVista products are being deployed globally and in over 100 million devices, ranging from cell phones to automobiles to Carrier equipment. Our domain expertise spans the gamut from network infrastructure (high performance and high availability of long device life and support capabilities), 5G Wireless & Software Defined Networks (Virtualization, Network Function Virtualization (NFV), Security, Datapath Acceleration (ODP & DPDK), Internet of Things (Connectivity, Reliability and Security) to General Embedded.

## HIGHLIGHT

### 5G

Low Latency and bandwidth  
Content Caching  
Heterogeneous Network  
Convergence  
Radio & BBU separation  
Network Slicing

### IoT

Connectivity—Wired, Wireless, Serial, Cloud etc.)  
Security—(Secure Boot, Root of Trust, Identity protection, Attack Prevention & Secure Update)  
Device Management

### NFV

Containers, Docker, KVM & Virt. Tools  
Data-plane (DPDK, ODP, OVS)  
MV Partners & MV LAB

### SPEED by MontaVista

Joint hardware and software solution to reduce time to market  
Dedicated point of contacts  
On-going optimization through joint feedback to ensure customer success

# MontaVista CGX Key Benefits

## MontaVista Is Your Linux Consultant



Custom BSP



Advanced Features



Kernel and Userland Customizations



Proxy Services



Multi-tenant Operating Systems



Flexible OSS & Linux Distribution Services



### Expertise

- Only working on Linux since 1999 – 1<sup>st</sup> Pre-emptible kernel, 1<sup>st</sup> Carrier Grade (6-9s HA)
- Supported embedded Linux in variety of markets and industries
- Accelerate your schedule – Triage problems quickly, backport future features, dedicated support engineering



### Reliability and Certainty

- Robust Quality Assurance Testing
- Frequent critical security patches and bug fixes
- Board Maintenance Program (BMP) - QA performed on customer hardware



### Lower Cost Ownership – Open Source +

- Embedded Linux distribution ready to run on SoC of choice, TODAY
- 10+ Years Maintenance
- Commercial Linux at a fraction of the cost of doing yourself

#### About MontaVista Software

MontaVista Software, LLC, a wholly owned subsidiary of Cavium Networks (NASDAQ:CAVM) is a leader in embedded Linux commercialization. For over 15 years, MontaVista has been helping embedded developers get the most out of open source by adding commercial quality, integration, hardware enablement, expert support, and the resources of the MontaVista development community.



**MontaVista Software**  
 2315 North First St, 4th FL  
 San Jose, CA 95131  
 Email: sales@mvista.com  
 Tel: +1-408-943-7451