high **integrity** systems

A Safety Systems Company Specializing in RTOS & Middleware

RTOS, Middleware, Support, & Consultancy
Committed to Safety

Safety Critical RTOS Experts

WITTENSTEIN high integrity systems (WHIS) is a developer of mission and safety critical Real Time Operating Systems (RTOS) and middleware products. WHIS is part of the WITTENSTEIN Group, a global technology company established in 1948 with a presence in over 45 countries.

A Safety Systems Company
WHIS is the Group's centre of excellence for high integrity and safety critical embedded systems design. Originally part of the aerospace division, WHIS is first and foremost a safety systems company, a key differentiation in the real-time operating systems market, as WHIS has direct experience of developing safety critical products.

The WHIS functional safety management structure, and high integrity development life cycles, ensure that the entire WHIS product range delivers consistently high levels of performance and dependability.

Our Relationship with FreeRTOS™
WHIS leverage RTOS technology from FreeRTOS™, the market leading embedded real time operating system. SAFERTOS® has a similar functional model to FreeRTOS, whereas OPENRTOS® is FreeRTOS, with a commercial license that includes professional support and middleware integration.

Partners

Dr David Cowling
Managing Director

A WITTENSTEIN pioneer with over 40 years’ experience in the aerospace industry, specialising in safety critical embedded systems design and flight-qualified fly-by-wire aviation systems.

Richard Barry
Creator of FreeRTOS™

An influential personality within the RTOS industry and well respected embedded expert. Renowned as the creator of FreeRTOS™, the author of several books and much in demand as a presenter at conferences and trade shows.

Andrew Longhurst
Business Development Manager

A skilled project leader with an extensive background in electrical, electronic and software engineering delivering an in-depth understanding of the challenges facing embedded engineers within the safety critical sector.

Steve Ridley
Head of Engineering

A highly knowledgeable and talented engineer with more than 20 years’ experience designing real time embedded software for use in safety critical applications across aerospace, automotive, industrial and telecoms industries.
RTOS & Middleware Components

The Complete, Integrated Solution

RTOS, Middleware, Tools and Services
The WHIS RTOS ecosystem has been tailored to enable embedded software engineers to develop robust and responsive products, efficiently and on-time.

Extensive Architecture and Tool Chain Support
WHIS products support an extensive range of embedded platforms including over 30 microprocessor architectures and more than 15 tool chains, providing solutions for commercial and safety critical applications, backed up by flexible licensing terms.

Knowledgeable, Comprehensive Support
Customers are supported from project conception and throughout the lifetime of their product. The WHIS team of expert engineers do not just provide technical support, but advice on how to use our components within a safety critical development, and guidance on all aspects of product certification.

From Single Products to Corporate Solutions
The extensive and feature rich WHIS product range offers a complete solution for engineers seeking software components for their next project, and for corporations seeking a single supplier to fulfill all their RTOS and middleware needs throughout their entire organization.

Continual Innovation
SAFERTOS® was the first RTOS to be certified to IEC 61508 by TÜV SÜD, as well as the first pre-certified RTOS to be ROM’ed within a mainstream microprocessor. WHIS continues to lead the way with its family of real time operating systems solutions that have revolutionized the RTOS market.

FreeRTOS™ is a market leader, with over 100,000 downloads per year

We offer commercial licensing, middleware, and professional support to create OPENRTOS®

We rebuilt for the safety sector, adding support for multiple certification standards to create SAFERTOS®

We provide a leading RTOS ecosystem that’s achieved global recognition

WITTENSTEIN Innovation Centre, Germany
SAFE RTOS is our Safety Certified real time operating system. It comes with an industry-tailored Design Assurance Pack (DAP) that supports certification to the relevant internationally recognised standard, allowing SAFE RTOS to deliver the ideal solution across multiple industries.

SAFE RTOS provides Industrial developers with a responsive, deterministic embedded Real Time Operating System (RTOS) with a Design Assurance Pack that provides an easy route to achieving certification once integrated into an Industrial Safety Product.

SAFE RTOS and its Design Assurance Pack are available pre-certified by TÜV SÜD to IEC 61508 Safety Integrity Level 3 (SIL3), the highest level possible for a software only component.
Medical

Our software is used in a wide variety of medical devices, from infusion pumps to defibrillators to prosthetics. Our experience allows us to offer solutions that accelerate the development of medical devices based on SAFERTOS and its Design History File, supporting FDA 510(k) class III medical device submissions and IEC 62304 class C certifications.

- FDA 510(k) class III medical device submissions
- IEC 62304 class C certification
- Independently assessed by TÜV SÜD to IEC 62304 Class C
- Extensively used in Medical Device developments

Aerospace

WHIS have years of experience working in the aerospace sector to draw on when providing RTOS solutions for safety critical applications. SAFERTOS provides developers with a responsive, robust, and deterministic embedded RTOS, containing features supporting the development of safety critical devices, coupled with an Aerospace Design Assurance Pack that provides a clear route to achieving certification once integrated within an aerospace product.

- DO178C DAL A
- Deterministic, responsive embedded RTOS
- Reduces certification time and costs
- Reduces product development risks

Automotive

SAFERTOS and its Automotive Design Assurance Pack are available pre-certified to the international Automotive Standard ISO 26262 ASIL D.

With an imperceptible boot time, SAFERTOS is an ideal choice in systems that need to protect drivers and vehicles from hazards quickly after a power on event. The imperceptible boot time also means SAFERTOS is ideally suited for use on the booting core of a multi-core/multi processor safety system. SAFERTOS can quickly and effectively bring the system up, configure the safety partitions and execute critical safety functionality before enabling other cores/processors, which may require longer to boot.

Nuclear

Typical SAFERTOS implementations in the nuclear industry include monitoring, sensing and control systems.

SAFERTOS supports the IEC 61513 development standard by the use of the standard SAFERTOS IEC 61508 Industrial DAP.

Rail

The majority of SAFERTOS rail developers, whether it be for track side or on carriage applications, purchase the standard Industrial DAP supporting certification to IEC 61508 SIL3. For those companies that need to demonstrate compliance to the European Rail Standard EN 50128, WHIS can provide the additional information required integrated into the DAP. SAFERTOS and its DAP support certification to EN 50128 SIL4.

Typical SAFERTOS rail applications include signalling, control systems, door management and communication systems.
SAFERTOS® is a pre-emptive, pre-certified real time operating system that delivers unprecedented levels of determinism and robustness to embedded systems. Based on the FreeRTOS™ functional model, but specifically re-designed for the safety market by our own team of safety experts, SAFERTOS is independently certified by TÜV SÜD to IEC 61508 SIL3 and ISO 26262 ASIL D.

Built Specifically for the Safety Market
Designing a safety critical RTOS is about more than just applying process. Risk management is required across the complete development life cycle to identify a full set of safety requirements. These safety requirements have a major impact on the implementation of the RTOS, resulting in a trusted product containing intrinsic self-verification routines and other features essential for use in a safety critical application.

A Smooth Certification Path
Using our extensive safety critical design experience we have made certifying SAFERTOS integrated within a product an easy and hassle-free process.

Contained within the DAP is the all-important Safety Manual. The Safety Manual explains exactly how to install and integrate SAFERTOS into your development environment. Following the concise instructions will also generate the evidence required by your auditors to confirm the process has been followed correctly. This removes the need to re-test SAFERTOS on your target hardware, and provides a solid, dependable platform for your development.

MMU/MPU Support as Standard
SAFERTOS is supplied with full Memory Management Unit (MMU) and Memory Protection Unit ( MPU support as standard. This allows both safety critical and non-safety critical code to be present within the same linear address space, whilst remaining isolated from each other, greatly reducing development time and cost.

Full Life Cycle Support
Our own team of software and safety experts are on hand to help. With extensive knowledge and direct experience of safety certified software, we can help resolve your technical, safety and certification issues.

As part of our standard support and maintenance agreement, we will revalidate your version of SAFERTOS with the latest compiler version, ensuring you can use SAFERTOS with the very latest tools.

Medical
- FDA 510(k)
- IEC 62304
- IEC 60601
- ISO 14971

Automotive
- ISO 26262
- IEC 61508

Aerospace
- DO 178C

Industrial
- IEC 61508
- IEC 61513
- IEC 62138

Railway
- EN 50128
- IEC 61508

Process
- IEC 61511

Key Features
SAFERTOS key features include:

- Intrinsic self-verification routines
- MMU/MPU support as standard
- Migration path from FreeRTOS and SAFERTOS CORE
- IEC 61508 SIL3 and ISO 26262 ASIL D certified by TÜV SÜD
- MISRA C compliant
- Contains no open source code
- 100% MC/DC verification coverage
- Supports wide range of microprocessors
- Supports all popular development tools
- Full source code and Design Assurance Pack
SAFERTOS® CORE

For Systems that Need to Consider Safety

SAFERTOS CORE provides the complete functionality and API of SAFERTOS. It’s designed to support embedded systems that need to consider safety, but don’t require safety certification to international design standards such as IEC 61508 SIL3.

Full SAFERTOS Functionality and API
SAFERTOS CORE uses the actual core SAFERTOS design, source code and API that is common across all safety certified SAFERTOS variants, ported for use on your specific processor/compiler combination. SAFERTOS CORE incorporates key safety features, combined with functionality that has a proven, successful history of use within embedded Safety Critical Applications.

SAFERTOS CORE is ideal for companies who are developing products that:

- Need to consider safety but don’t require full certification
- May require certification in the future, and need to future proof their designs
- Require a robust, highly deterministic RTOS, incorporating key safety features
- Are at the start of a lengthy development cycle where certification evidence/documentation will not be required until the final stages

SAFERTOS or SAFERTOS CORE?
SAFERTOS is designed for systems that require safety certification.

SAFERTOS CORE is designed for embedded systems where safety needs to be considered, or designed-in for future consideration, but where full safety certification/documentation is not required, or not needed at the start of a long safety system product life cycle.

Whereas SAFERTOS is supplied with a Design Assurance Pack (Industrial), or a Design History File (Medical) supporting safety certification, SAFERTOS CORE is supplied as source code accompanied by a comprehensive User’s Manual.

SAFERTOS CORE is available fully integrated with our advanced, feature rich Middleware and Safety Components, delivered as one seamless build of code.

Safety Components

Increase the Integrity of your Products

Our safety components are designed to bring greater integrity to your safety critical application. All of our safety components are delivered as high integrity modules, with both full source code and a Design Assurance Pack built to the same exceptionally high standard as SAFERTOS.

SAFEXchange™
Securely share safety critical data between multiple processors and cores across black channel communication buses. Conforms to the principles of IEC 61784-3.

SAFECheckpoints
Provides a sophisticated task monitoring capability that allows the user to specify timing tolerances for critical sections of code.

SAFECRC Checker
Guard against corruption and malicious attack by confirming the correctness of your program memory.
OPENRTOS® provides a commercial license for FreeRTOS™, the highly successful, small, efficient embedded real time operating system. OPENRTOS and FreeRTOS share the same code base, however OPENRTOS truly transitions developers into the professional world, with commercial licensing, and access to direct support, backed up by tools, training and consultancy services. Developers can extend the functionality of OPENRTOS by selecting from a wide range of middleware components and Board Support Packages.

OPENRTOS supports a large number of microprocessors and FPGA soft cores, can be used in System on Chip devices and even ROM’ed into the memory of microprocessors.

Start Your Development for Free
Our novel approach to licensing means developers can start their development for free using FreeRTOS and upgrade to OPENRTOS later when a commercial license, middleware, or support is required. FreeRTOS updates and ports are simultaneously released by WITTENSTEIN high integrity systems as OPENRTOS.

Professional Service
WHIS takes responsibility for ensuring OPENRTOS works with your chosen processor / compiler combination, verifies its correct operation, and delivers a working demonstration project with full source code integrated with any purchased middleware components. This approach has been designed to ensure your developers are working effectively with our products without delay. OPENRTOS is also supplied with one year’s free support, giving you direct access to our team of highly experienced engineers.

Supporting Your Processor
OPENRTOS supports a wide number of processors, including those that FreeRTOS does not support. Our team of engineers are experienced in porting OPENRTOS to a variety of processors, optimizing speed and integration. If your processor is not supported by FreeRTOS, please ask us about creating a new version of OPENRTOS for your specific processor.

Key Features
OPENRTOS key features include:
- Pre-emptive, cooperative, & round robin scheduling options
- Unlimited number of tasks and priority levels
- Queues, semaphores and mutexes
- Event Flags
- Task Notification
- Run time statistics
- Very efficient software timers
- Uses minimum system resources
- Supports wide range of microprocessors
- Supports all popular tool chains
- Very large user base
- Easy to use

Royalty Free, Perpetual Licensing
We aim to provide customers with a license model that best suits their needs, supported by a transparent pricing policy.

Our standard licensing model uses a royalty free, perpetual license with an unlimited number of production units.

We have four standard levels of licensing- Single Product, Product Line, Multi Product and Corporation, but remain flexible and receptive to the needs of our customers.
OPENRTOS IE is a powerful, small footprint RTOS and IE Driver solution for the Intel Innovation Engine (IE), located on Intel's Data Server Platforms. OPENRTOS IE allows system builders to develop novel functionality on Intel server platforms quickly and efficiently, helping to create product differentiation within the server market.

**Intel Innovation Engine**
The Innovation Engine is a small Intel architecture processor and I/O sub-system embedded into Intel's Server Platforms. The Intel IE enables system builders to create their own unique, differentiating firmware for the server, storage and networking markets. Some possible usages include a lightweight BMC providing basic manageability and reduced overall system cost, or to improve server performance by offloading BIOS and BMC routines to the IE.

**The Most Compact Solution**
OPENRTOS IE is a fast, lightweight, small footprint Real Time Operating System complete with a comprehensive set of IE device drivers. OPENRTOS is the smallest RTOS option enabled for the Intel IE, with the RTOS requiring less that 10Kbytes and the entire RTOS and IE driver solution less than 100Kbytes, maximizing the amount of memory available for the system builder's application code.
Middleware

Fully Integrated ‘Out of the Box’ Solutions

WHIS Middleware components are feature rich, and designed specifically for embedded platforms. They are available with all WHIS RTOS products as one highly integrated, fully optimized and verified package, accompanied by a demonstration application, allowing engineers to work effectively from the day they are delivered.

When integrating middleware with SAFERTOS, our safety engineers will use the SAFERTOS MPU functionality to isolate middleware code from other safety critical code segments. This allows mixed safety integrity levels of software to coexist within the same build of code, resulting in lower development & production costs.

Board Support Packages (BSP)

We provide full Board Support Package services, and will design to your specific requirements for use with either OPENRTOS or SAFERTOS.

TCP/IP

Our networking solution is a scalable, thread safe TCP/IP stack. It provides a familiar, standards based, Berkeley sockets interface, making it as simple to use and as quick to learn as possible. An alternative callback interface is also available for advanced users.

It's features and RAM footprint are fully scalable, making it equally applicable to smaller, lower throughput microcontrollers as to larger more powerful processors. It is available with a light weight HTTPS web server. Please ask one of our sales representatives for more details.

File Systems

Our storage solution provides a compact, resource efficient and highly reliable embedded FAT16/FAT32 file system, created especially for embedded applications that use portable storage media such as SD/MMC, USB drives and Flash.

Key Features
- Supports wide range of NAND, NOR, SD, MMC, and USB storage devices
- Supports multiple volumes
- Long filenames
- Robust and re-entrant
- Fail safe journaling system

USB

USB Host

Our USB Host is a high performance, scalable stack that enables an embedded host to control a variety of USB devices. It supports multiple device classes with automatic device type detection, driver assignment and application notification.

USB Device

Our USB Device is a small, efficient and easy to use solution which enables connection of USB devices to PCs and other USB hosts.
Development Tools

In Depth Analysis

SAFERTOS+Trace
SAFERTOS+Trace is a powerful profiling tool, that visualizes real time system events, enabling engineers to debug and optimize their applications.

- Over twenty different interlinked views
- Analyze CPU loading profiles
- Understand the interaction of tasks and ISR
- Provides tracing of all kernel events
- Logging of additional user defined events
- Runs on any Windows host
- Smooth magnification and scrolling to change views

STATEVIEWER
Stateviewer is a development tool providing enhanced kernel awareness, including the ability to check the stack usage of each task as well as the task’s switching and resource states. The Stateviewer IDE plug-in tool is offered with IAR and Eclipse tools and works with both OPENRTOS and SAFERTOS. It is freely available for download from our website.

Support, Training & Consultancy

Benefit from our Expertise

Training Courses
Utilize our experienced team of engineers to really get the most from your product. Understand the full capability of your RTOS and make greater use of its features, leading to enhanced designs and shortened development schedules.

Consultancy
Our consultancy services have been designed to support our customers, allowing us to share our knowledge and experience to help optimize the final design, improve the design processes, and smooth the route to certification.

Sometimes just a few hours of consultancy to review a preliminary design and check the approach being taken is correct can deliver significant benefits to the outcome of a project.

Support
We offer support with all of our products. Be assured that our engineers will be there when you need them throughout the lifetime of your product.
WITTENSTEIN high integrity systems use an ISO 9001:2015 Quality Management System, certified by Lloyds Register LRQA UK applicable to:

"Design, development, installation and support of high integrity systems and software for medical, aviation and industrial applications."