



RTOS Debugger for QNX

ARM
Atom
PowerPC
SuperH
x86
XScale

- Real Time, non-intrusive Display of QNX System Resources
- Kernel and/or Application Debugging
- Debugging Several QNX Applications At Once
- Dynamic Thread Performance Measurement
- QNX Specific Evaluation of Real Time Trace Listing
- Statistical and Graphic Display of Thread Run Times
- Thread related Evaluation of Function Run Times
- Thread Stack Coverage
- PRACTICE Functions for OS Data
- QNX related Pull-Down Menu

The TRACE32 System includes a configurable RTOS debugger to provide symbolic debugging in real time operating systems. Our software package contains a ready-to-run configuration for the QNX Real Time Kernel from QNX Software Systems Ltd.

In close cooperation with QSSL, we built a high sophisticated QNX awareness, which enables you to do a most effective debugging with the TRACE32 systems on targets running QNX.

RTOS Debugging in TRACE32 with QNX

Real Time, Non-Intrusive Display of QNX System Resources

The TRACE32 RTOS debugger for QNX provides display functions to show internal information. The system resources processes, threads and libraries can be displayed, and the QNX "pidin" command is emulated. If the target allows memory reads while running, the display of all these regions

can be viewed non-intrusively in real time. The tables are updated permanently ("On The Fly"), without affecting the application at all. Moreover, these functions are still available, even when the pidin command is not linked to your software.

The screenshot displays four windows from the TRACE32 RTOS debugger:

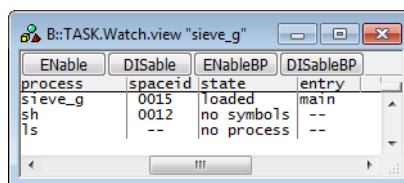
- B::TASK.Process**: A table listing system processes with columns for magic, pid, spaceid, #thr, and name.
- B::TASK.Thread**: A table listing threads with columns for magic, name, pid, tid, prio, state, and blocked.
- B::TASK.PIDIN**: A table showing the emulation of the pidin command with columns for pid, tid, name, prio, state, and blocked.
- B::TASK.Process "sieve_g" /Open**: A detailed view of the 'sieve_g' process, showing its flags, arguments, threads, and loaded libraries.

Process list, detailed view of one process, thread list and pidin emulation

Kernel and/or Application Debugging

Due to the fact, that TRACE32 is a hardware debugging tool, you are able to debug anything you want, including bootstrap code, initialization phase, interrupt routines, drivers, kernel, etc. TRACE32 includes a complete MMU support, providing mechanisms to inspect the target memory using virtual addresses or physical addresses and to show the translation tables.

Additionally, TRACE32 has a special MMU support for several address spaces, which allows you to debug several QNX applications (processes) at once. An internal logic provides you with an easy access to all process memory spaces. A special process detection mechanism allows to halt the application exactly on the entry point of a process, allowing you to debug your process right from main().

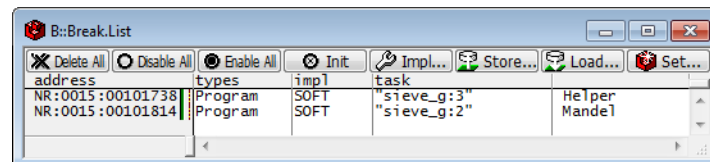


Process watch list

Thread Related Breakpoints

Any breakpoint set in the TRACE32 debugger can be set dependent to a specific thread. This means, that the

breakpoint will then only halt, if hit by the specified thread. This allows thread related debugging even in shared code.

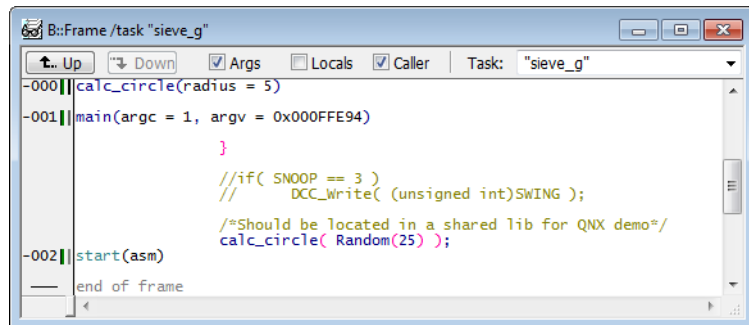


Breakpoint list window with thread specific breakpoints

Thread Context Display

The TRACE32 RTOS debugger provides an easy way to switch the current displayed context to another thread. Normally all register related windows (e.g. listing at current PC, local variables of function call stack) are dis-

played related to the actual context (i.e. current executed task). You can switch to the context of another task to see all this information at the time this task was scheduled.



```

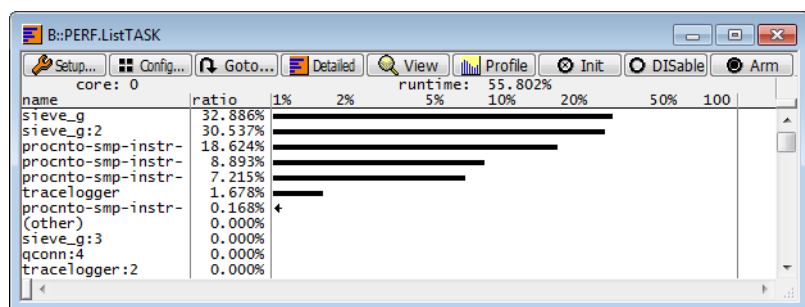
B::Frame /task "sieve_g"
-000|| calc_circle(radius = 5)
-001|| main(argc = 1, argv = 0x000FFE94)
    }
    //if( SNOOP == 3 )
    //    DCC_Write( (unsigned int)SWING );
    /*Should be located in a shared lib for QNX demo*/
    calc_circle( Random(25) );
-002|| start(asm)
    end of frame
  
```

Function call hierarchy of a specific thread

Dynamic Thread Performance Measurement

While QNX is running, TRACE32 is capable of recurrently evaluating the current running thread and collecting the results. The percentage, each thread consumes of the system, is then

displayed graphically and updated permanently. The longer time you let the measurement run, the more exact are the results. This feature is available even without any hardware trace.



Performance measurement list

QNX Specific Display of Trace Listing

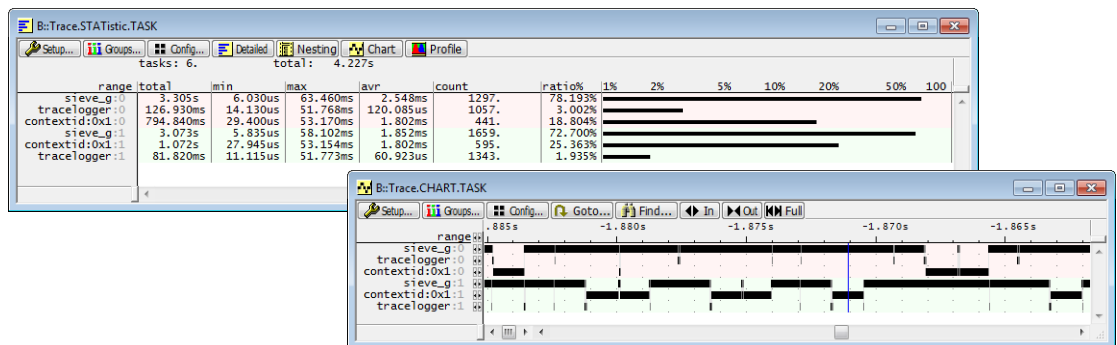
The data recorded in the real time trace buffer (if available) can be displayed and interpreted specific to the operating system. The thread switches are

displayed symbolically, either exclusively or in addition to other information.

Statistic Evaluation and Graphic Display of Thread Run Times

Out of the real time trace buffer (if available), the analyzer can calculate statistic tables of thread run times and thread switches. A graphical diagram

shows which thread was active at a specific time, giving a clear view of the behavior of the system.



Statistics and flow of threads

Thread Related Evaluation of Function Run Times

The statistic and graphic evaluation of function calls and function run times (if available) can be done dependant to the actual running thread. This is nec-

essary, if different threads call one single function at the same time, or if a thread switch occurs in between the function.

Statistic Evaluation and Graphic Display of Thread States

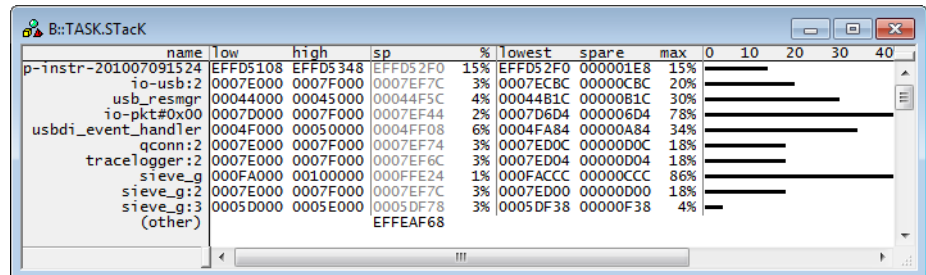
These tabular and graphical analyses of the status of threads show the various states (i.e. running, ready, waiting, suspended and undefined) and times

each thread spent in each state. A graphical view of the data can help to highlight prioritization problems, critical paths etc.

Thread Stack Coverage

In real time systems it is quite important to know, how much stack space each thread consumes. For this purpose

a special window shows the current and the maximum usage of each separate thread.



Thread stack coverage window

PRACTICE Functions for OS Data

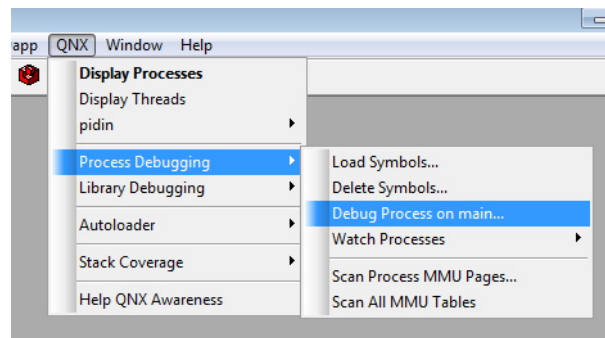
The support includes extended PRACTICE functions for process specific data. E.g. the function “task.proc.space

(“hello”)” returns an id specifying the MMU memory area that this process uses.

QNX Related Pull-Down Menu

Because the menu bar of the TRACE32 user interface can be fully customized, you can create a new pull down menu, including operating system specific commands. We deliver

QNX support with an example for such specific menus, which provides fast and easy access to the QNX specific features.



QNX specific menu items

Contact

International Representative

Argentina

Anacom Eletronica Ltda.
Mr. Rafael Sorice
Rua Nazareth, 807, Barcelona
BR-09551-200 São Caetano do Sul, SP
Phone: +55 11 3422 4200
FAX: +55 11 3422 4242
EMAIL: rsorice@anacom.com.br

Australia

Embedded Logic Solutions P/L
Mr. Ramzi Kaffan
Suite 2, Level 3
144 Marsden Street
Parramatta NSW 2150
Phone: +61 2 9687 1880
FAX: +61 2 9687 1881
EMAIL: sales@emlogic.com.au

Austria

Lauterbach GmbH
Alltaufstr. 40
D-85635 Höhenkirchen-Siegertsbrunn
Phone: +49 8102 9876 130
FAX: +49 8102 9876 187
EMAIL: sales@lauterbach.com

Belgium

Tritec Benelux B.V.
Mr. Robbert de Voogt
Stationspark 550
NL-3364 DA Slidrecht
Phone: +31 184 41 41 31
FAX: +31 184 42 36 11
EMAIL: software@tritec.nl

Brazil

Anacom Eletronica Ltda.
Mr. Rafael Sorice
Rua Nazareth, 807, Barcelona
BR-09551-200 São Caetano do Sul, SP
Phone: +55 11 3422 4200
FAX: +55 11 3422 4242
EMAIL: rsorice@anacom.com.br

Canada

Lauterbach Inc.
Mr. Udo Zoettler
4 Mount Royal Ave.
USA-Marlborough, MA 01752
Phone: +1 508 303 6812
FAX: +1 508 303 6813
EMAIL: info_us@lauterbach.com

China Beijing

Lauterbach Technologies Co., Ltd
Mr. Linglin He
Beijing Office
A3, South Lishi Road, XiCheng District
Beijing 100037, P.R. China
Phone: +86 10 68023502
FAX: +86 10 68023523
EMAIL: linglin.he@lauterbach.com

China Shenzhen

Lauterbach Technologies Co., Ltd
1406/E Xihaimingzhu Building
No.1 Taoyuan Road, Nanshan District
Shenzhen 518052, P.R. China
Phone: +86 755 8621 0671
FAX: +86 755 8621 0675
EMAIL: emily.zhang@lauterbach.com

China Suzhou

Lauterbach Technologies Co., Ltd
Mr. Linglin He
Hengyu Square, Rm 709
No. 188, Xing Hai Street
Suzhou, 215021 P.R. of China
Phone: +86 512 6265 8030
FAX: +86 512 6265 8032
EMAIL: info_cn@lauterbach.com

Czech Republic

Lauterbach GmbH
Alltaufstr. 40
D-85635 Höhenkirchen-Siegertsbrunn
Phone: +49 8102 9876 130
FAX: +49 8102 9876 187
EMAIL: sales@lauterbach.com

Denmark

Nohau Danmark A/S
Mr. Flemming Jensen
Hørkær 26, Plan 4
DK-2730 Herlev
Phone: +45 44 52 16 50
FAX: +45 44 52 26 55
EMAIL: info@nohau.dk

Egypt

Lauterbach GmbH
Alltaufstr. 40
D-85635 Höhenkirchen-Siegertsbrunn
Phone: +49 8102 9876 130
FAX: +49 8102 9876 187
EMAIL: sales@lauterbach.com

Finland

Nohau Solutions Finland
Mr. Martti Viljainen
Tekniikantie 14
FI-02150 Espoo
Phone: +358 40 546 0142
FAX: +358 9 2517 8101
EMAIL: sales@nohau.fi

France

Lauterbach S.A.R.L.
Mr. Jean-Pierre Paradiso
Europarc - Le Hameau B
135 Chemin Des Bassins
F-94035 Créteil Cedex
Phone: +33 1 49 56 20 30
FAX: +33 1 49 56 20 39
EMAIL: info_fr@lauterbach.com

Germany

Lauterbach GmbH
Sales Team Germany
Alltaufstr. 40
D-85635 Höhenkirchen-Siegertsbrunn
Phone: +49 8102 9876 130
FAX: +49 8102 9876 187
EMAIL: sales@lauterbach.com

Greece

Lauterbach GmbH
Alltaufstr. 40
D-85635 Höhenkirchen-Siegertsbrunn
Phone: +49 8102 9876 130
FAX: +49 8102 9876 187
EMAIL: sales@lauterbach.com

Hungary

Lauterbach GmbH
Alltaufstr. 40
D-85635 Höhenkirchen-Siegertsbrunn
Phone: +49 8102 9876 130
FAX: +49 8102 9876 187
EMAIL: sales@lauterbach.com

India-Bangalore

Electro Systems Associates Pvt. Ltd.
Mr. G. V. Gurunatham
S-606, World Trade Center
Malleswaram West, No.26/1, Dr. Rajkumar
Road
India - Bangalore 560055
Phone: +91 80 67648888
FAX: +91 80 23475615
EMAIL: Trace32sales@esaindia.com

India-Chennai

Electro Systems Associates Pvt. Ltd.
Mr. D. Kannan
No.109 /59A - Ground Floor
IV Avenue, Ashok Nagar
India - Chennai - 600 083 Tamilnadu
Phone: +91 044-24715750
FAX: +91 44 24715750
EMAIL: chennai@esaindia.com

India-Delhi

Electro Systems Associates Pvt. Ltd.
Mr. R.K. Bhandari
No. 705, 7th Floor, Laxmi Deep
Shivajinagar
India - Delhi - 110 092
Phone: +91 11-22549351
FAX:
EMAIL: delhi@esaindia.com

India-Hyderabad

Electro Systems Associates Pvt. Ltd.
Mr. C.V.M. Sri Ram Murthy
Shop No. 14, "Global Enclave"
Bhagyanagar Colony, Kukat pally
India - Hyderabad 500 072
Phone: +91 40-23063346
FAX: +91 40-23063346
EMAIL: hyderabad@esaindia.com

India-Kolkata

Electro Systems Associates Pvt. Ltd.
Mr. Arun Roy
India - Kolkata
Phone: +91 98305 78843
FAX:
EMAIL: kolkata@esaindia.com

India-Pune

Electro Systems Associates Pvt. Ltd.
Mr. R K Bhandari
Shriram Complex, 1126/1, Model Colony
Shivajinagar
India - Pune - 411 016
Phone: +91 20 - 30462035 / 25663
FAX: +91 20-25677202
EMAIL: pune@esaindia.com

Ireland

Lauterbach Ltd.
Mr. Richard Copeman
11 Basepoint Enterprise Centre
Stroudley Road
Basingstoke, Hants RG24 8UP
Phone: 0044-118 328 3334
FAX:
EMAIL: info_uk@lauterbach.com

Israel

Itec Ltd.
Mr. Mauri Gottlieb
P.O.Box 10002
IL-Tel Aviv 61100
Phone: +972 3 6491202
FAX: +972 3 6497661
EMAIL: general@itec.co.il

Italy

Lauterbach Srl
Mr. Maurizio Menegotto
Via Enzo Ferrieri 12
I-20153 Milano
Phone: +39 02 45490282
FAX: +39 02 45490428
EMAIL: info_it@lauterbach.com

Japan

Lauterbach Japan, Ltd.
Mr. Kenji Furukawa
3-8-8 Shinyokohama
Kohoku-ku, Nisso 16th Building
Yokohama-shi, Japan 222-0033
Phone: +81 45 477 4511
FAX: +81 45 477 4519
EMAIL: info@lauterbach.co.jp

Luxembourg

Tritec Benelux B.V.
Mr. Robbert de Voogt
Stationspark 550
NL-3364 DA Sliedrecht
Phone: +31 184 41 41 31
FAX: +31 184 42 36 11
EMAIL: software@tritec.nl

Malaysia

Flash Technology
Mr. Teo Kian Hock
No 61, # 04-15 Kaki Bukit Av 1
Shun Li Industrial Park
SGP-Singapore 417943
Phone: +65 6749 6168
FAX: +65 6749 6138
EMAIL: teokh@flashtech.com.sg

Mexico

Lauterbach Inc.
Mr. Udo Zoettler
4 Mount Royal Ave.
USA-Marlborough, MA 01752
Phone: +1 508 303 6812
FAX: +1 508 303 6813
EMAIL: info_us@lauterbach.com

Netherlands

Tritec Benelux B.V.
Mr. Robbert de Voogt
Stationspark 550
NL-3364 DA Sliedrecht
Phone: +31 184 41 41 31
FAX: +31 184 42 36 11
EMAIL: software@tritec.nl

New Zealand

Embedded Logic Solutions P/L
Mr. Ramzi Kattan
Suite 2, Level 3
144 Marsden Street
Parramatta NSW 2150
Phone: +61 2 9687 1880
FAX: +61 2 9687 1881
EMAIL: sales@emilogic.com.au

Norway

Nohau Solutions AB
Mr. Jörgen Nilsson
Derbyvägen 6D
SE-21235 Malmö
Phone: +46 40 592 206
FAX: +46-40 592 229
EMAIL: Jorgen.nilsson@nohau.se

Poland

QUANTUM Sp. z o.o.
Mr. Aleksander Bil
ul. Jeleniogorska 6
54-056 Wrocław
Phone: +48 71 362 6356
FAX: +48 71 362 6357
EMAIL: info@quantum.com.pl

Portugal

Captura Electronica, SCCL
Mr. Juan Martinez
c/Duero, 40
E-08031 Barcelona
Phone: +34 93 429 5730
FAX: +34 93 407 0778
EMAIL: info@captura-el.com

Romania

Lauterbach GmbH
Altlaufstr. 40
D-85635 Höhenkirchen-Siegersbrunn
Phone: +49 8102 9876 130
FAX: +49 8102 9876 187
EMAIL: sales@lauterbach.com

Russia

RTSoft
Mr. Alexey Isaev
Nikitinskaya 3
RUS-105037 Moscow
Phone: +7 495 742 6828
FAX: +7 495 742 6829
EMAIL: sales@rtsoft.msk.ru

Singapore

Flash Technology
Mr. Teo Kian Hock
No 61, # 04-15 Kaki Bukit Av 1
Shun Li Industrial Park
SGP-Singapore 417943
Phone: +65 6749 6168
FAX: +65 6749 6138
EMAIL: teokh@flashtech.com.sg

South Korea, Pangyo

Hancom MDS Inc.
Mr. Dongwook Jun
3FL, Hancom Tower
49, Daewangpangyo-ro 644, Bundang-gu
Seongnam-si, Gyeonggi-do, 463-400, ROK
Phone: +82-31-627-3000
FAX: +82-31-627-3100
EMAIL: trace32@hancommds.com

Spain

Captura Electronica, SCCL
Mr. Juan Martinez
c/Duero, 40
E-08031 Barcelona
Phone: +34 93 429 5730
FAX: +34 93 407 0778
EMAIL: info@captura-el.com

Sweden

Nohau Solutions AB
Mr. Jörgen Nilsson
Derbyvägen 6D
SE-21235 Malmö
Phone: +46 40 592 206
FAX: +46 40 592 229
EMAIL: Jorgen.nilsson@nohau.se

Switzerland

JDT Jberg DatenTechnik
Mr. Andreas Jberg
Zimmereistrasse 2
CH-5734 Reinach AG
Phone: +41 62 7710 886
FAX:
EMAIL: Andreas.Jberg@jdt.ch

Taiwan

Superlink Technology Corp.
Mr. Sulin Huang
3F-8, No. 77, Sec. 1, Xintaiwu Rd., Xizhi District,
New Taipei City 22101, Taiwan, R.O.C.
Phone: +886 2 26983456
FAX: +886 2 26983535
EMAIL: info.stc@superlink.com.tw

Tunisia

Lauterbach Consulting S.A.R.L.
Mr. Khaled Jmal
Route El Ain Km 3.5
TN-3062 Sfax
Phone: +216-31361061
FAX: +216-74611723
EMAIL: info_tn@lauterbach.com

Turkey-1

Tektronik Muh. ve Tic. A.S.
Mr. Hakan Yavuz
CyberPlaza B-Blok, 702B
Bilkent
06800 Ankara
Phone: +90 312 437 3000
FAX: +90 312 437 1616
EMAIL: info@tektronik.com.tr

Turkey-2

G3TEK Embedded Technologies Ltd.
Mr. Celal Aygun
Ilkyerlesim Mah. 445.
Sok. No: 48
06370 Battikent/Ankara
Phone: +90 312 3324769
FAX: +90 312 3324769
EMAIL: info@g3tek.com

UK

Lauterbach GmbH
Mr. Richard Copeman
Altlaufstr. 40
D-85635 Höhenkirchen-Siegertsbrunn
Phone: +49 8102 9876 190
FAX: +49 8102 9876 187
EMAIL: sales@lauterbach.com

USA East

Lauterbach Inc.
Mr. Udo Zoettler
4 Mount Royal Ave.
USA-Marlborough, MA 01752
Phone: +1 508 303 6812
FAX: +1 508 303 6813
EMAIL: info_us@lauterbach.com

USA West

Lauterbach Inc.
Mr. Bob Kupyn
1111 Main Street, Suite 620
USA-Vancouver, WA, 98660
Phone: +1 503 524 2222
FAX: +1 503 524 2223
EMAIL: bob.kupyn@lauterbach.com

Additional Information

<http://www.lauterbach.com>

Lauterbach GmbH

Altlaufstr. 40
D-85635 Höhenkirchen-Siegertsbrunn
Tel. ++49 8102 9876-0 FAX -999
info@lauterbach.com
http://www.lauterbach.de

Lauterbach Inc.

4 Mount Royal Ave.
Marlboro MA 01752
Phone (508) 303 6812 FAX (508) 303 6813
info_us@lauterbach.com
http://www.us.lauterbach.com

Lauterbach Ltd.

11 Basepoint Enterprise Ctre Stroudley Road
Basingstoke, Hants RG24 8UP
Phone ++44-1256-333-690 FAX -661
info_uk@lauterbach.com
http://www.lauterbach.co.uk

Lauterbach S.A.R.L.

135 Chemin Des Bassins
F-94035 Créteil Cedex
Phone ++33-149-562-030
FAX ++33-149-562-039
info_fr@lauterbach.com
http://www.lauterbach.fr

Lauterbach Japan, Ltd.

3-9-5 Shinyokohama Kouhoku-ku
Yokohama-shi Japan 222-0033
Phone ++81-45-477-4511 FAX -4519
info_j@lauterbach.com
http://www.lauterbach.co.jp

Lauterbach s.r.l.

Lauterbach s.r.l.
Via Enzo Ferrieri 12
I-20153 Milano
Phone ++39 02 45490282
FAX ++39 02 45490428
info_it@lauterbach.it
http://www.lauterbach.it

Suzhou Lauterbach Consulting Co.,Ltd.

Room 1605, Xing Hai International Square
No.200, Xing Hai Street
Suzhou, 215021 PR of China
Phone: 0086-512 6265 8030
FAX: 0086-512 6265 8032
info_cn@lauterbach.cn
http://www.lauterbach.cn

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