THE DEVELOPER'S CONFERENCE

Trilha Embedded
Windows CE em sistemas Embarcados

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Agenda

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- Contextualização
- Windows CE
- Mapa Desenvolvimento
- Desenvolvimento de OS
- Desenvolvimento de Aplicação
- Ferramentas de Teste

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Contextualização

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- O que é um sistema embarcado?
- Loja de departamentos x “Loja de roupas da esquina”
- Tópicos sobre S.O. para Sistemas Embarcados

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Windows Embedded **Compact**

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- Windows CE 1.0: (1996 – 2001)

Windows Embedded CE 6.0

- 2006 - 2018.
- Process address space is increased from 32 MB to 2 GB
- Number of processes has been increased from 32 to 32,768
- User mode and kernel mode device drivers are possible
- 512 MB physically managed memory
- Device.exe, filesys.exe, GWES.exe have been moved to Kernel mode
- Cellcore
- SetKMode and set process permissions no longer possible
- System call performance improved

Windows Embedded Compact 7.0

- 2011 - 2022
- Multi-core CPU support (SMP)
- Wi-Fi Positioning System
- Bluetooth 3.0 + HS support
- DLNA (Digital Living Network Alliance)
- DRM technology
- Media Transfer Protocol
- Windows Phone 7 IE with Flash 10.1 support
- NDIS 6.1 support
- UX C++ XAML API / Windows Presentation Foundation / Silverlight
- Modernized graphics based on OpenGL ES 2.0
- Advanced touch and gesture input
- Kernel support for 3 GB physical RAM and supports ARMv7 assembly

Windows Embedded Compact 2013

- 2013 – 2023
- DHCPv6 client with stateful/stateless address configuration.
- L2TP/IPsec over IPv6 for VPN connectivity.
- Snapshot boot.
- Improved XAML data binding and Expression Blend support.
- OOM Model improvements from 7.0
- HTML help viewer added.

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Fonte: http://en.wikipedia.org/wiki/Windows_CE

Licenças

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- "C7NR" SKU: Offers key foundational operating system components targeted towards portable navigation devices.
- "C7E" SKU: Provides OEMs with a comprehensive package of operating components to develop a wide variety of general embedded devices.
- "C7G" SKU: Provides Consumer Internet Device (CID) OEMs a competitive package that includes web browsing, media playback and messaging as well as foundational and connectivity technologies necessary for internet devices. These SKUs are ideal for set top boxes, portable media players, mobile internet devices, digital picture frames, digital media adapters, and eLearning devices. C7G SKU is available on Windows Embedded Compact 7.
- "C7P" SKU: Offers the richest set of components and applications to enable complex consumer and enterprise class devices. C7P SKU can satisfy complex scenarios such as remote desktop connectivity, data sync via Active Sync, web browsing, media playback, email, contact management, and voice communication. It also includes a software development kit to allow devices to be customized and extended by end customers. C7P SKU is ideal for many device categories including thin clients, mobile handheld terminals, and industrial automation controllers.
- "C7T" SKU: C7T provides RemoteFX out of the box as well as security technology like Kerberos, CredSSP and NTML technology so that your thin clients are enterprise ready.

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Windows Embedded **Compact**

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- Small Footprint – Modularizável
- Compatível com arquiteturas: x86, ARM, MIPS
- Ferramentas de teste e desenvolvimento eficientes
- Gerenciamento de Consumo de Energia.
- Prevenção de corrupção de arquivos: exFAT, TexFAT

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Suporte a Real Time

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- Multitarefas
- Preemptivo
- Agendamento de tarefas por prioridade
- Agendamento Round-Robin
- Sincronização
  - Queues, Semaphores, MailBoxs, Mutex, etc...

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Freescale Webminar

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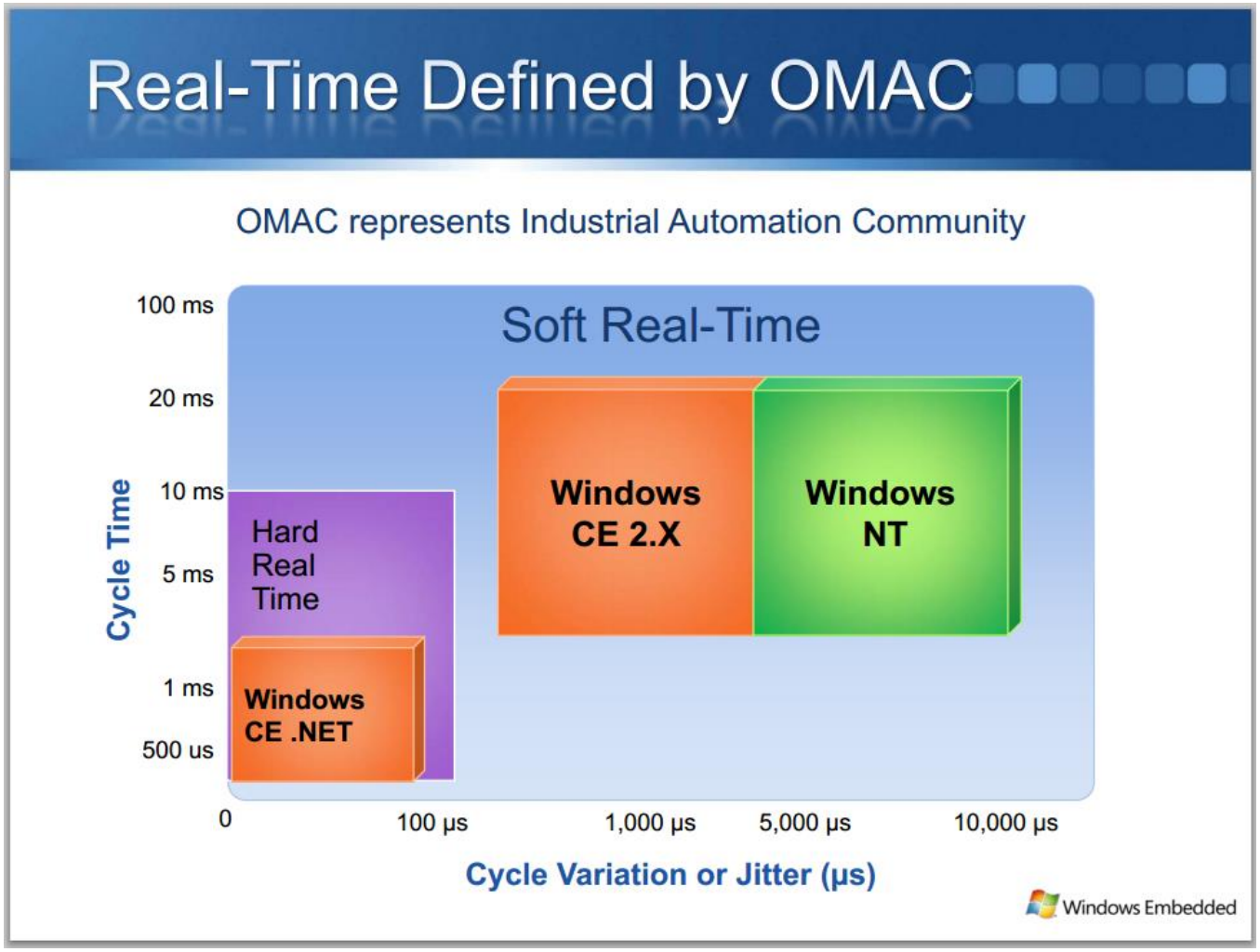

http://www.freescale.com/webapp/sps/site/training_information.jsp?code=WBNR_VFTF09_WINCE_REALTIME&fsrch=1&sr=2&pageNum=1#

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Comparação RTOS

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A Real Time Operating Systems (RTOS) Comparison

Rafael V. Aroca[1], **Glauco Caurin**[1]

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Table 1. Worst times measured during the experiments. A: Response Time (1/maximum sustained frequency), B: Latency, C: Latency Jitter

	Win XP	Win CE	Neutrino	μC/OS-II	Linux	RTAI	VxWorks
A	200μs	20μs	20μs	1,92μs	13,89μs	5μs	3,85μs
B	848μs	99μs	35,2μs	3,2μs	98μs	11,4μs	13,4μs
C	700μs	88,8μs	32μs	2,32μs	77,6μs	7.01μs	10,4μs

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Balanço

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Sistema estável, maduro e rico em ferramentas.

Suportado por uma das maiores empresas de software do mundo.

A Microsoft não tem receita enquanto seu produto não estiver no mercado.

Não existe preocupação com relação a propriedade intelectual.

Facilidade de programação/Ecossistema de programadores.

Custo de Licença.

Arquitetura relativamente fechada.

Dificuldade de encontrar especialistas no Sistema Operacional.

Dificuldade de encontrar Drivers para equipamentos especiais.

Suporte relativamente limitado a Microsoft.

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Mapa de desenvolvimento

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BSP
DEVICE DRIVERS
SISTEMA OPERACIONAL

- Platform Builder

Desenvolvimento de Aplicação Específica

- Platform Builder + Visual Studio
- OS_SDK + Visual Studio
- OS_SDK + outra ferramenta

Teste de S.O.
Debug de S.O.

- Platform Builder
- Visual Studio

até Windows EC 7.0

- Visual Studio 2008 / 2005
- Platform Builder
- .NET Compact Framework 3.5

A partir do Windows EC 2013

- Visual Studio 2012/2013
- Novo Platform Builder
- .NET Compact Framework 3.9
- CRT e C++ (Atualizado)

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Demo sobre desenvolvimento de aplicação

Referência

http://msdn.microsoft.com/en-US/library/gg154201(v=winembedded.70).aspx

http://msdn.microsoft.com/en-us/library/ee488200(v=winembedded.70).aspx

www.embedded101.com

www.developer.toradex.com

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Demo desenvolvimento de S.O.

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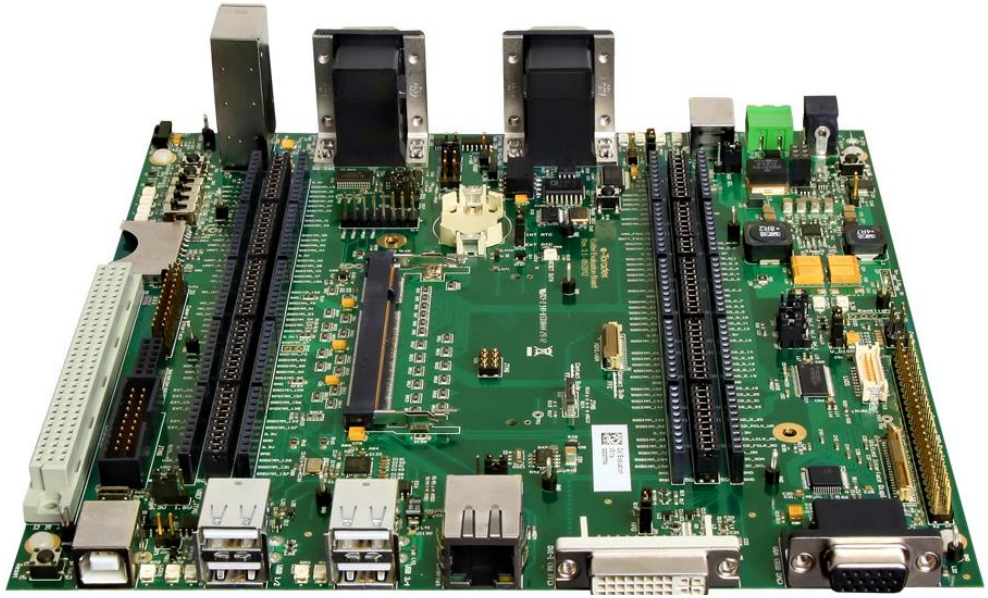
Hardware utilizado: Colibri T20 + Placa de Desenvolvimento



Coleção de BSPs
http://www.microsoft.com/windowsembedded/en-us/bspcatalog.aspx?fsr=1&manu=36&proc=1&tar=&WEItemsPerPage=10

Coleção de Device Drivers
http://www.microsoft.com/windowsembedded/en-us/drivercatalog.aspx

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Ferramentas de Teste

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- Kernel Tracker
  - Analisar de forma gráfica a execução do Kernel
- Teste de OS
  - ILTIMMING - RT
  - OSBENCH - RT
  - Heap Walker - Memória
- Teste de Aplicação
  - http://msdn.microsoft.com/en-us/library/gg154684.aspx

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Demo do Kernel Tracker

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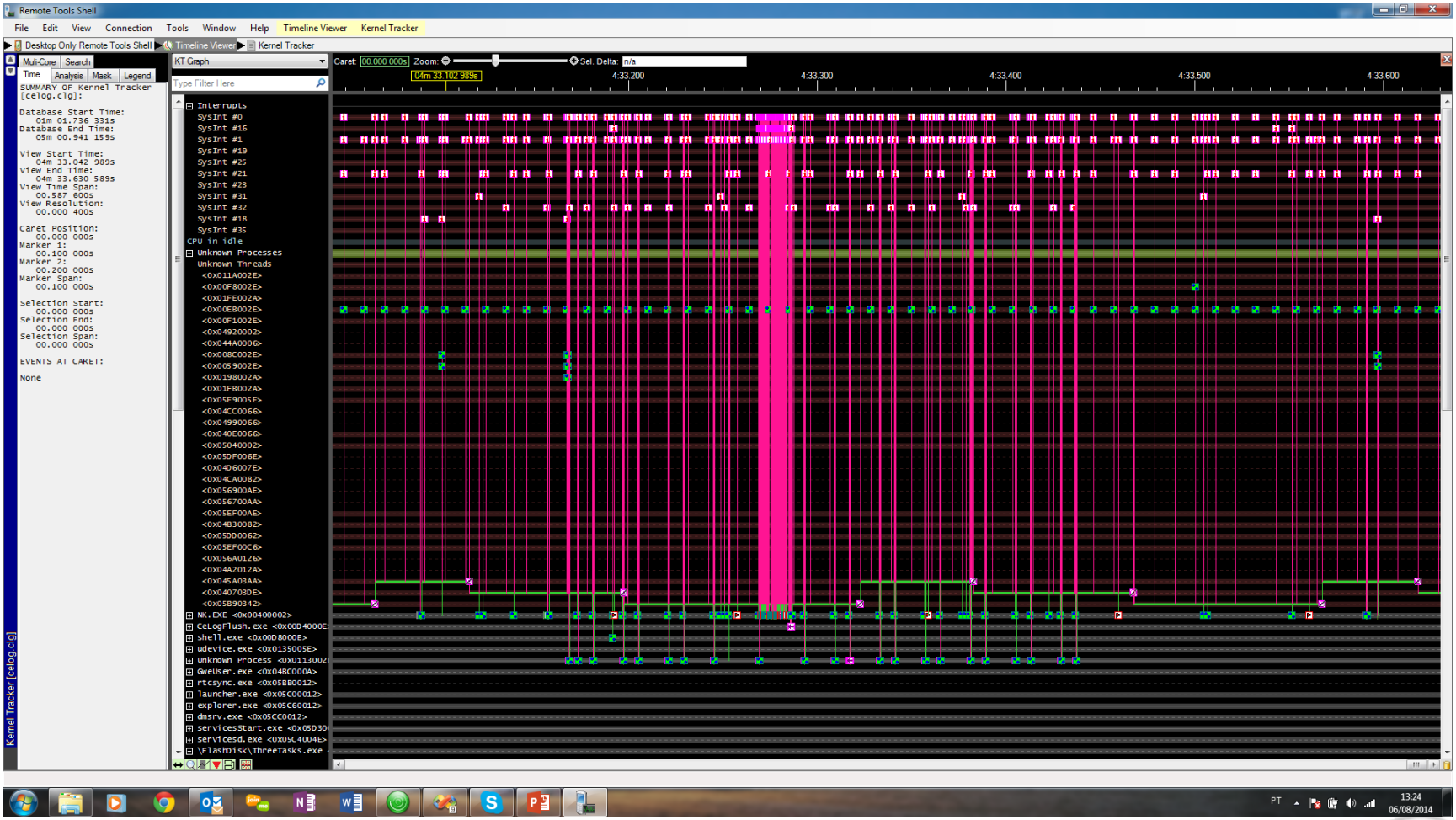

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Perguntas?

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Referências:

Toradex Portal: www.toradex.com.br & www.developer.toradex.com

Freescale Webminar

Microsoft:

- http://www.microsoft.com/windowsembedded/en-us/bspcatalog.aspx?fsr=1&manu=36&proc=1&tar=&WEItemsPerPage=10
- http://www.microsoft.com/windowsembedded/en-us/drivercatalog.aspx
- http://msdn.microsoft.com/en-US/library/gg154201(v=winembedded.70).aspx
- http://msdn.microsoft.com/en-us/library/ee488200(v=winembedded.70).aspx

www.embedded101.com

www.developer.toradex.com

Livro: Professional Windows Embedded Compact 7 – Samuel Phung, David Jones, Thierry Joubert - 2011

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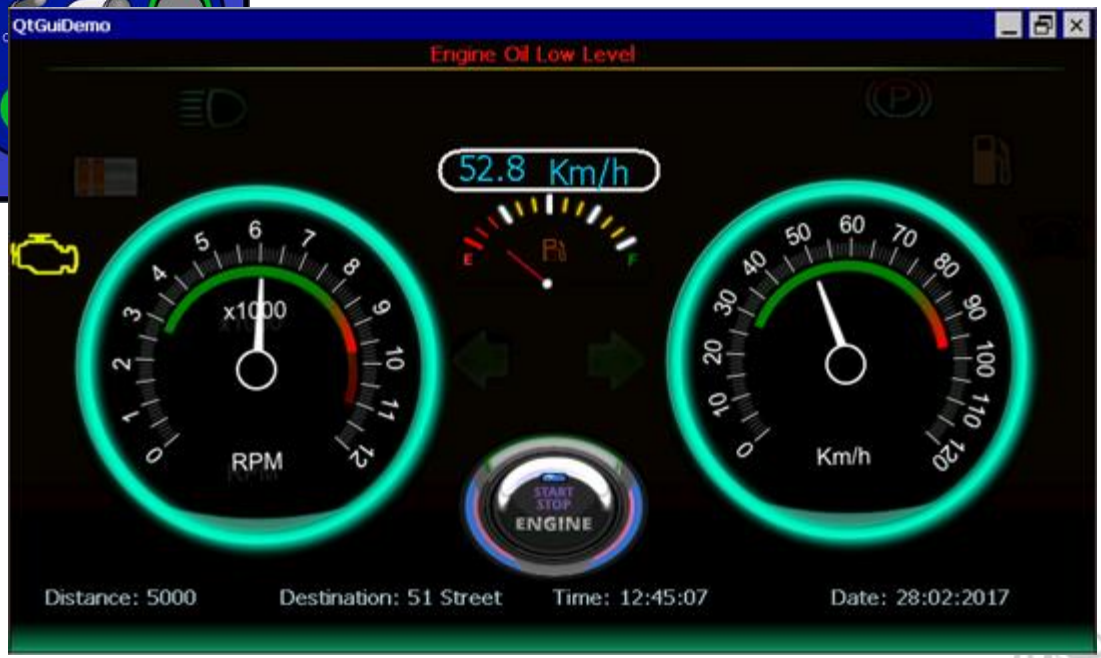
Interfaces

Silverlight

http://developer.toradex.com/knowledge-base/how-to-create-a-silverlight-application

http://developer.toradex.com/knowledge-base/how-to-create-a-qt-application

QT



Round Robin

PROCESSO	P_0	P_1
DURAÇÂO	5	8
HORA DE CHEGADA	0	1

FILA DE PRONTOS

PROCESSADOR
P_1

TEMPO
13

QUANTUM
2 segundos

Cronologia