



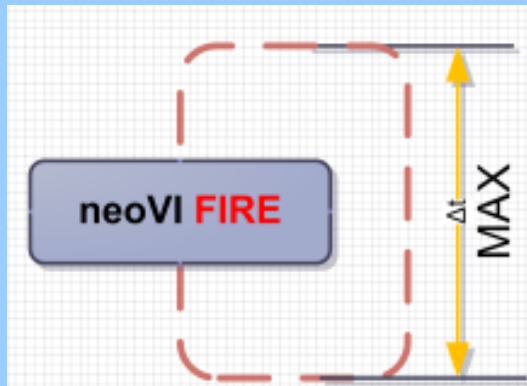
INTREPID CONTROL SYSTEMS, INC.



INTREPID CONTROL SYSTEMS

“Achieving low-cost real-time testing on Windows”

Test Expo Europe Tech Forum



Presented by Intrepid:

- Dave Robins, President
(daverobins@intrepidcs.com)

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www.intrepidcs.com

1



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Overview

- Intrepid has developed a real time scripting engine which runs on low cost hardware
- The PC can load scripts via DLL interface
- The PC can control, debug and monitor the script
- The script executes real time giving the PC capability for precise measurement and control



Intrepid The Company

- Focus on vehicle serial data tools
- Founded in 1994
- 30 employees in USA, China, and India
- 30% or higher growth past five years and including 2008's run rate
- Over 5000 tools sold globally in all automotive markets
- Distributors in Korea, Japan, Mexico, Singapore



3

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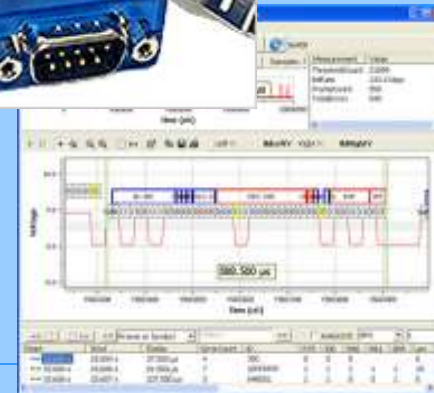


Intrepid Products

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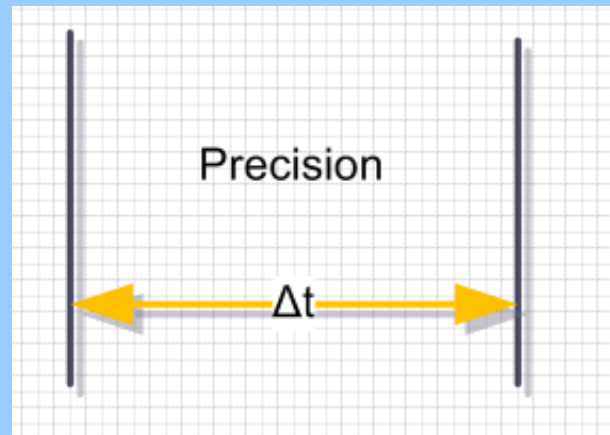
- **Vehicle Spy:** Bus Analysis, Simulation, and data acquisition
- **neoVI Hardware:** Multichannel CAN and LIN interfaces for the PC
- **ValueCAN :** Low cost signal and dual channel CAN to USB interfaces
- **WaveBPS:** Analog analysis of serial data with decoding for FlexRay, CAN, and LIN





Real Time : Why?

- Faster test execution
- Precise test stimulus
- Time sensitive measurement
- Eliminating latencies associated with bulk oriented comm interfaces such as Ethernet, USB or wireless





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Real Time : Why not?

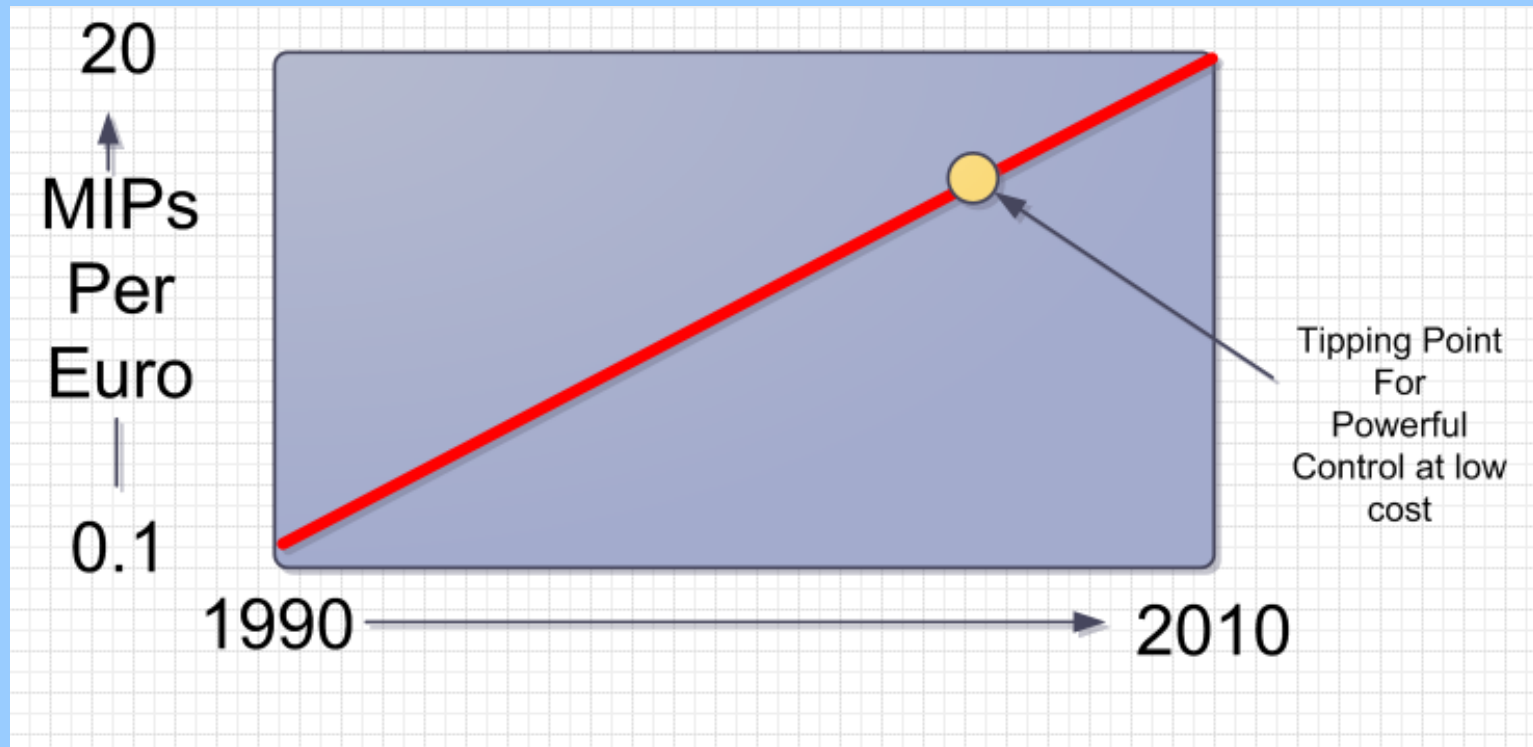
- Expensive hardware
- Complicated tools for usage





Real Time : Reducing Costs...

- Silicon capable of not trivial real time performance is getting inexpensive



7

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Real Time : Simplifying Usage

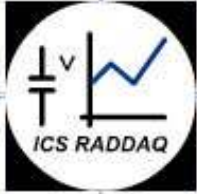
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- Simple but powerful logically complete point and click scripting
- Script objects and functions compatible with automotive electronics
- Powerful debugging tools

Step	Description	Value
1		
2	⌚ Wait For	1.000000 sec
3	📄 Transmit	Test Request
4	⌚ Wait Until	Equation Not Set
5		
6		
7		
8		
9		
10		

1		
2	🔄 Start a loop	50 [49]
3	📄 Set Value	{MISC IO 1 (VALUE) :NEO0-MIO-0-INDEX(0) [1973]} = not {MISC IO 1 (VALUE) :NEO0-MIO-0-INDEX(0) [1973]}
4	⌚ Wait For	0.009 of 0.100 sec
5	🛑 End the last loop	
6	📄 Log Data	CAN2: Pulse Generated
7	🛑 Stop	n/a



How it works

- Write and Debug script with PC connected in the loop
- After script is working compile
- A binary script file is created
- The script will then be transferred to the device for HIL execution





Enabling Real Time with Windows Apps

- **Step 1** : PC commands load script
- **Step 2** : PC commands the script to start
- **Step 3**: PC monitors script in execution
- **Step 4**: When script completes PC reads the results
- Repeat **steps 1 – 4** as necessary with all the different scripts



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DLL APIs

- ScriptLoad(pScriptData)
- ScriptStartStop(bStart)
- ScriptVariableReadWrite()
- ScriptTxMsgWrite()
- ScriptRxMsgRead()



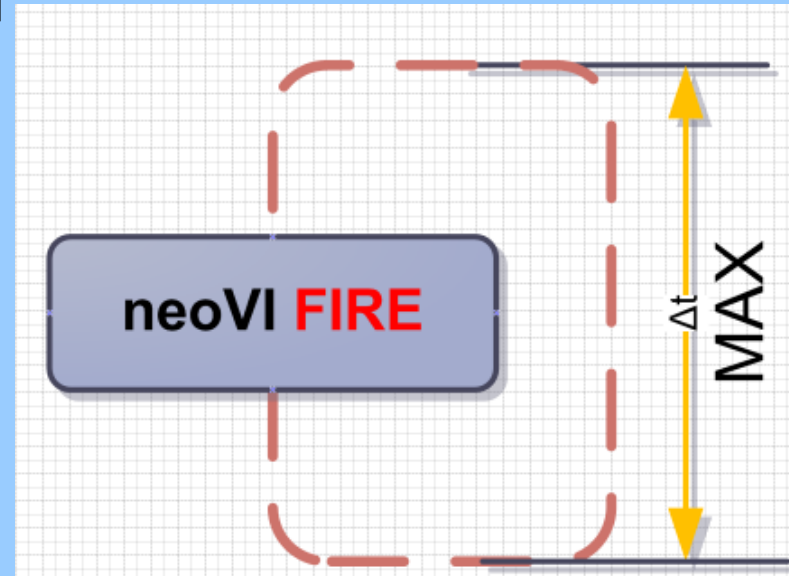
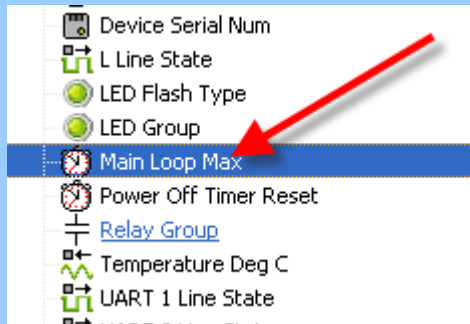
Script Capability

- Parallel script execution
- Full expression evaluation using 32.32 fixed point math
- Script objects for messages and signals
- Script objects to measure timing very accurately
- Script capability to control host data rate for throttling data
- Microsecond timing control
- Log data to debug output



Knowing your “Real Time”

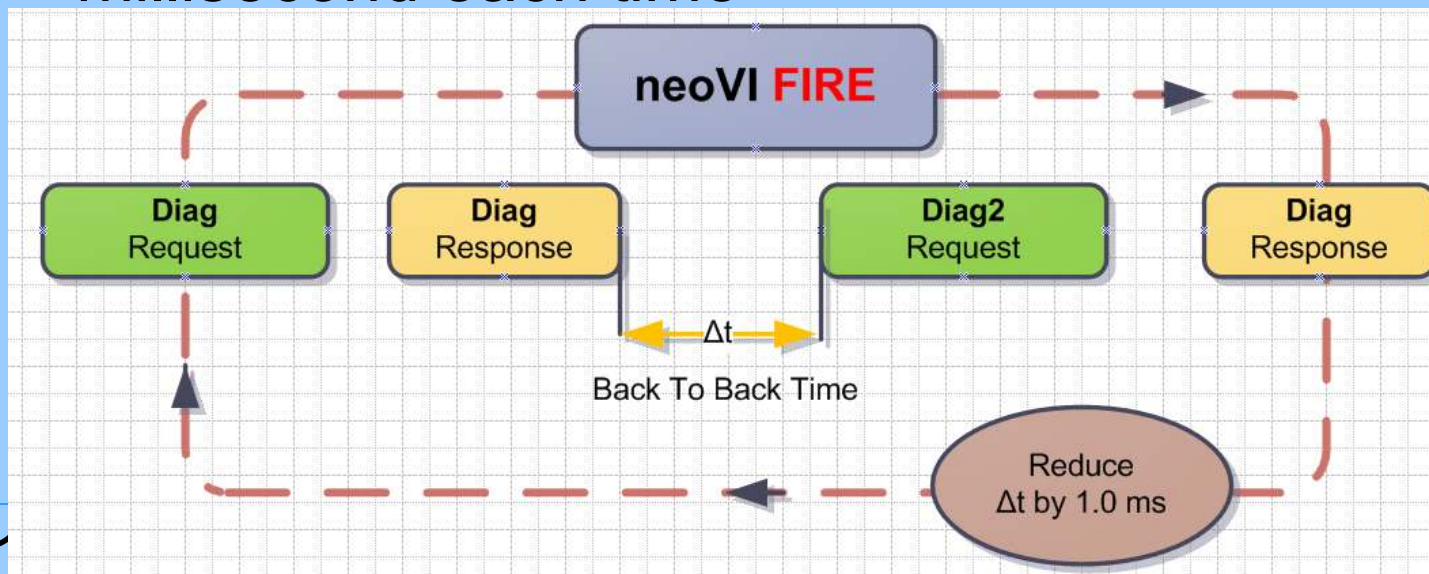
- Script provides variables allowing script to read main loop time
- The maximum loop time is your real time precision





Script Example 1 : Diagnostic Requests

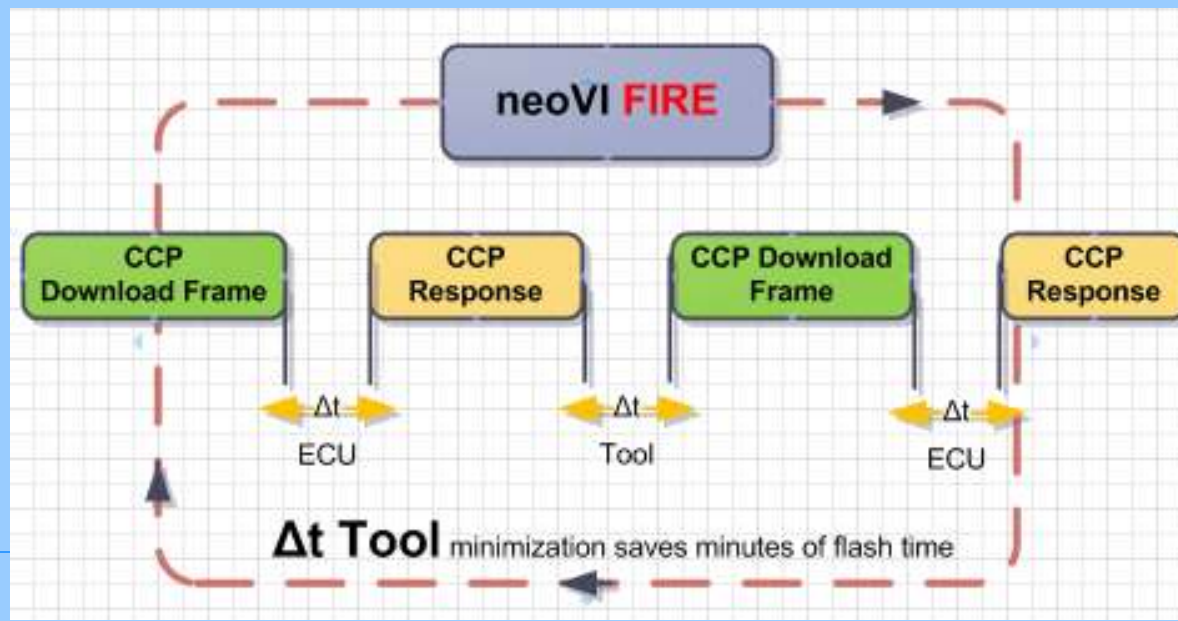
- Send a diagnostic request
- Wait until response and verify
- Wait a delay Tdelay in milliseconds
- Send the 2nd request
- Wait until response and verify
- Repeat loop reducing the Tdelay by 1.0 millisecond each time





Script Example 2 : CCP speed up

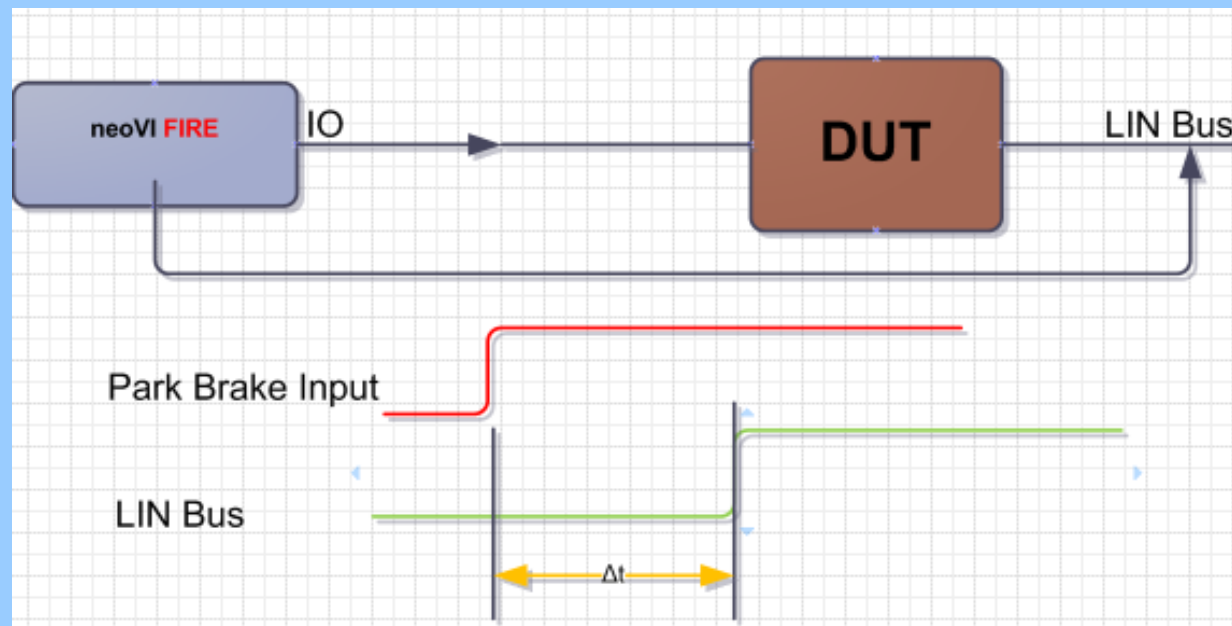
- Send all CCP download messages to the device
- Script sends one message and waits for the proper response
- The script then repeats the previous steps until the download is complete



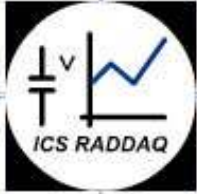


Script Example 3 : IO Latency

- Script enables an IO line and records the time
- Script waits until a CAN message is received and calculates the time difference from the IO line



16



Summary

- Intrepid implemented a real time script engine that runs on low cost/low power CPUs
- The script engine allows you to offload tasks from PC
- The tool uses simplified tools with a full debug environment
- Low cost real time is enabled by advances in low cost silicon
- This script is present in all 3g hardware including neoVI FIRE and ValueCAN3