DeltaV Users Benefit From Matlab Computing

Emerson Process Management

Advanced Control

Austin, Texas

EMERSON™

Process Management

Matlab

- The language of scientific, technical and financial computing - tens of toolboxes for the application in the following areas;

  – Data acquisition

  – Signal and image processing

  – Control design and analysis

  – Math & and analysis

  – Finance and economics

Interfacing Matlab to Real World

- Data files
- I/o boards
- Advanced serial ports
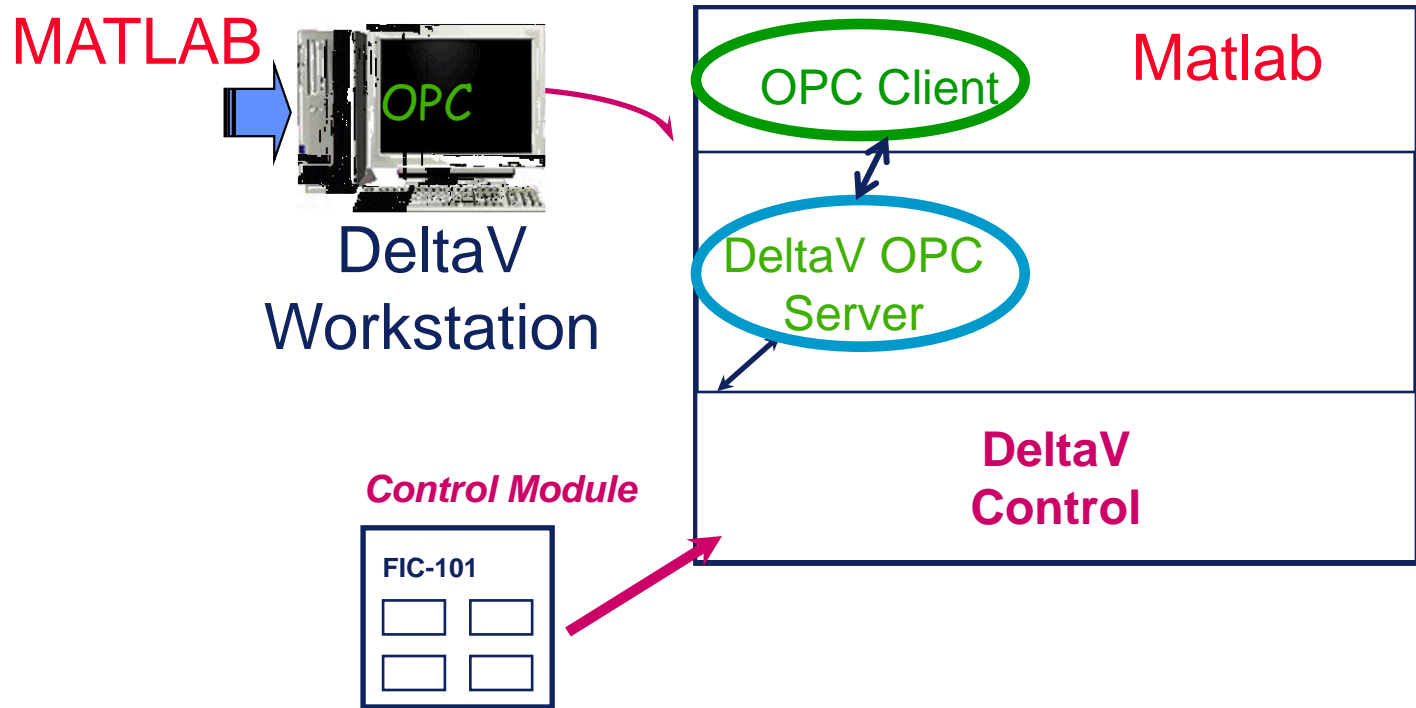- Gpib
- Network

$=$ Expensive to implement, time consuming translation to Simulink required, not easy

- OPC

Easy

  - Easy to implement
  - Duplication of functionality avoided
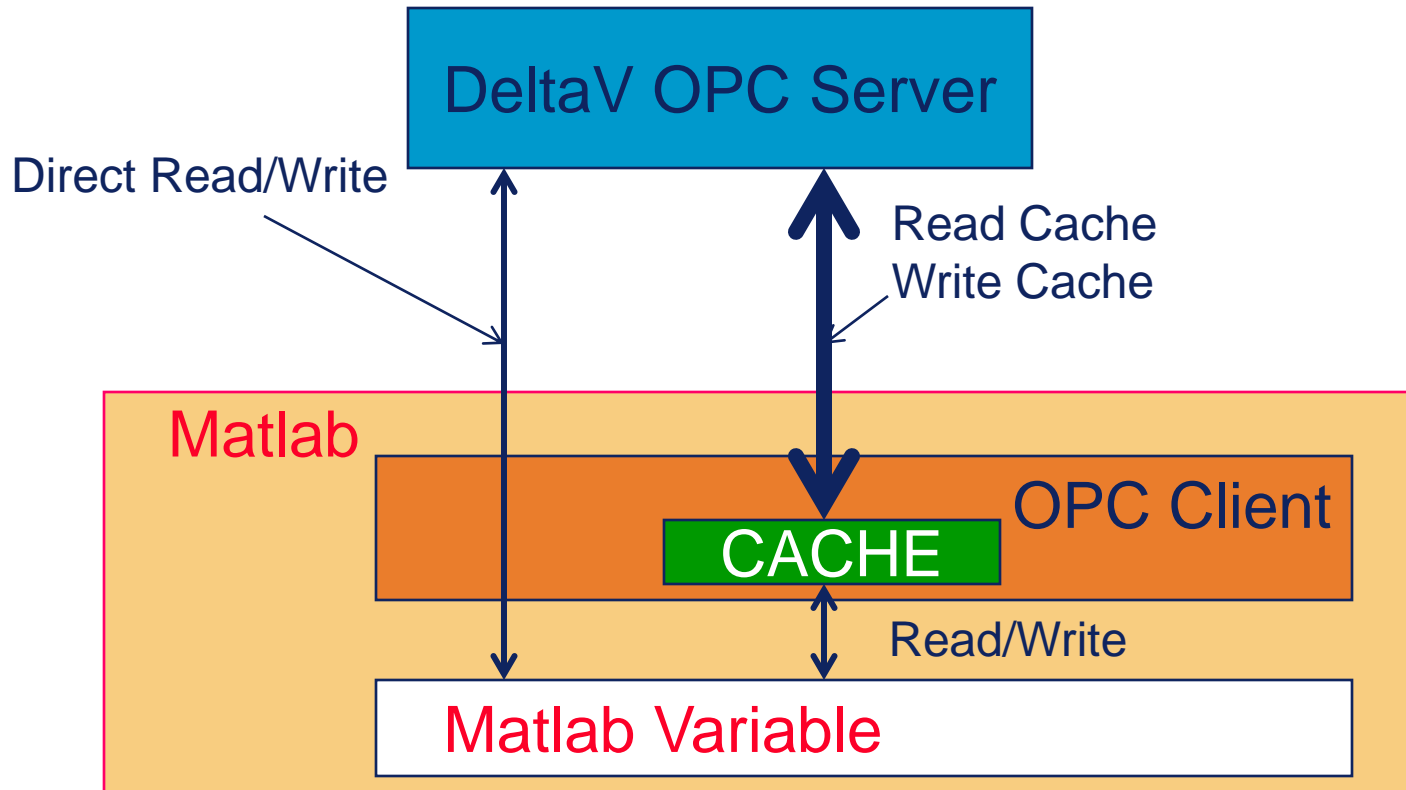 - Invisible to DeltaV operation

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Integration of Matlab into DeltaV

MATLAB

OPC

DeltaV
Workstation

OPC Client

Matlab

DeltaV OPC
Server

Control Module

FIC-101

DeltaV
Control

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Matlab OPC Client

- May be purchased directly from IPCOS TECHNOLOGY/ISMC NV (approx. 500 EU)

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Matlab - DeltaV Transfer Types

DeltaV OPC Server

Direct Read/Write

Read Cache
Write Cache

Matlab

OPC Client

CACHE

Read/Write

Matlab Variable

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Matlab - DeltaV Transfer Features

- **Direct Read/Write**
  - For transfer of insignificant amount of data (tags)
  - Speed depends on the actual system load
  - Maximum speed: scan ~100 msec. For ~10 tags
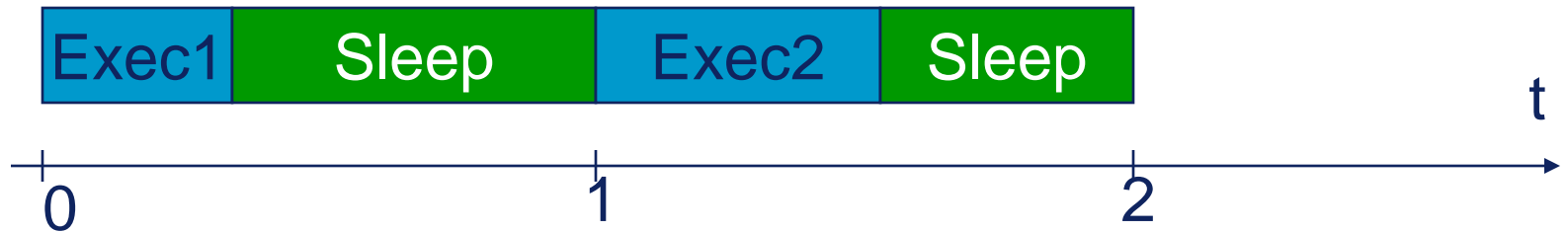
- **Cache Read/Write**
  - For transfer of significant amount of data - thousands of tags
  - Speed is defined by DeltaV server
  - Current speed: scan ~ 1 sec.

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Synchronizing Matlab Environment

- Matlab sleep

| Exec1 | Sleep | Exec2 | Sleep | t |

0   1   2
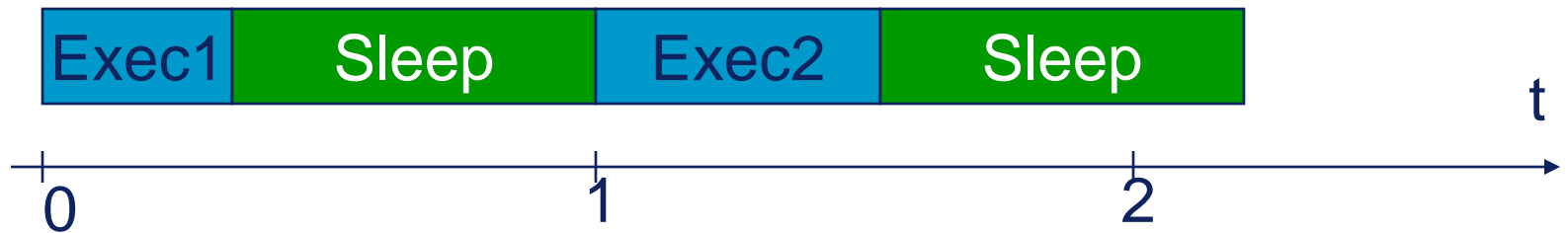
- OPC client sleep - adjusts sleep to keep constant scan

| Exec1 | Sleep | Exec2 | Sleep | t |

0   1   2

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Programming - direct device access

- Initialize Client (One time)
  - ```
    hr=mxOPC('open','Opc.DeltaV.1','localhost');
    ```
- Set Device Mode (One time)
  - ```
    r=mxOPC('ReadMode','Device');
    ```
- Set Scan - Sleep (One time)
  - ```
    mxOPC('Sleep',500);
    ```
- Activate Sleep / Test missing scans (Once per scan)
  - ```
    Nmissed = mxOPC('Sleep');
    ```
- Read Value from the loop (Once per read/write)
  - ```
    [value,hr]=mxOPC('ReadDouble','MATLABPID/PID1/PV.CV');
    ```

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Programming - Cache Access

Extra code:

- Set Cache (One time)
  - ```
    hr=mxOPC('SetDoubleCache',
    'MATLABPID/PID1/GAIN.CV',1,0);
    ```
- Set Cache Mode
  - ```
    hr=mxOPC('ReadMode','Cache');
    ```
- Read Cache (Once per scan)
  - ```
    hr=mxOPC('ReadCache');
    ```

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Test applications

- Read/Write control loop parameters

- Testing transfer speed for various modes

- Prototyping adaptive controller (in process of development)

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Conclusion

- Integrating DeltaV and Matlab is easy

- Using Matlab advances DeltaV for easy development and prototyping computationally demanding applications

- DeltaV with Matlab is a perfect tool for educational and research labs