GENeric programming Interface for CAMeras

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Version 2.8

Questions Answered in this Presentation

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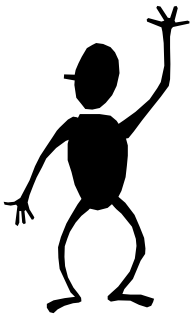
- Why GenICam Standard?
- How does it work?
- How is the standard committee organized?
- Who is driving GenICam?
- What is the status and the roadmap?
- How can you become part of GenICam?
- What are your benefits?



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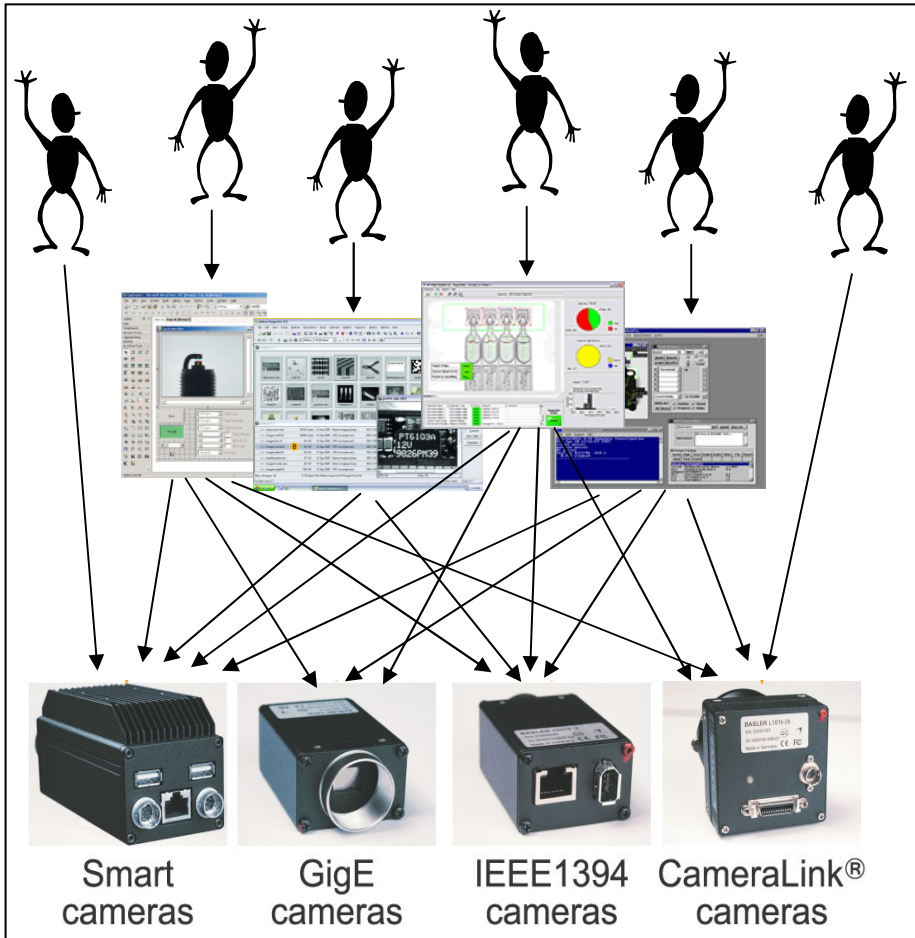
Situation Yesterday



Customers want to use…
- …any image processing library
- …any camera
- …any smart feature in the camera

Camera Vendors want to..
- …sell to every customer
- …supply their smart features

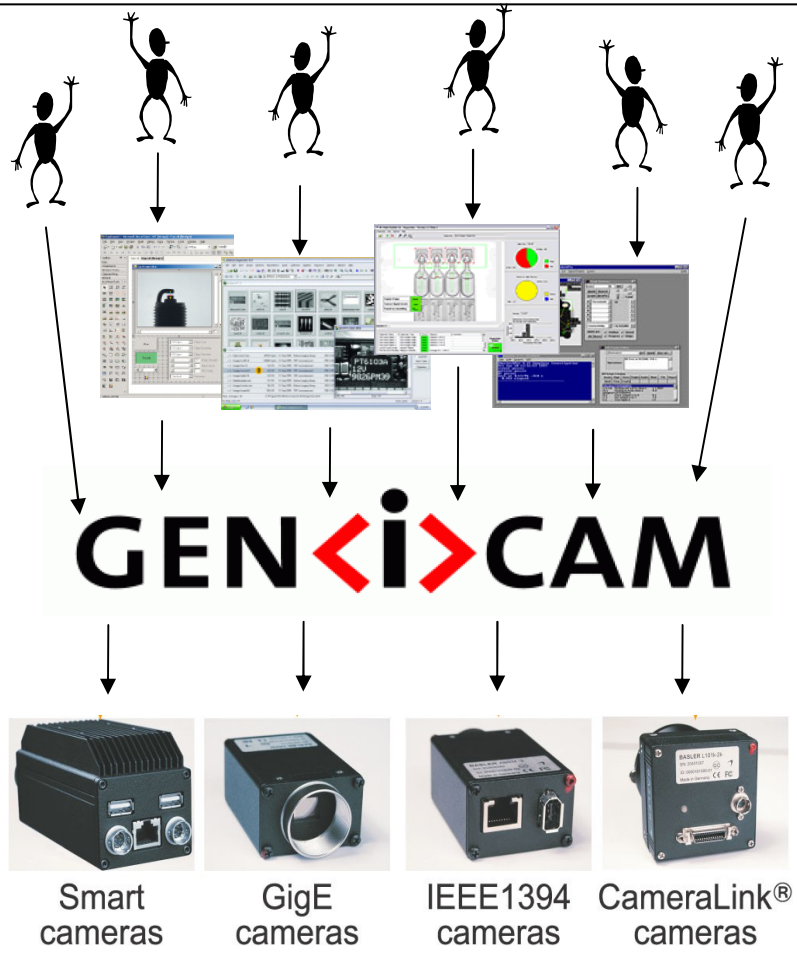
Library Vendors have to…
- …support all cameras
- …support all smart features

➔ **This is expensive**

➔ **This reduces time-to-market**

➔ **This prevents market growth**

Situation Today



GenICam can connect the Customer..

- …to all cameras
- …through all libraries
- …giving access to all smart features

GenICam can support…

- …any interface technology
- …products from any vendor
- …products with different register layout

GenICam is easy to integrate for…

- …customers
- …camera vendors
- …software library vendors
- …frame grabber / driver vendors

GenICam in an NutShell

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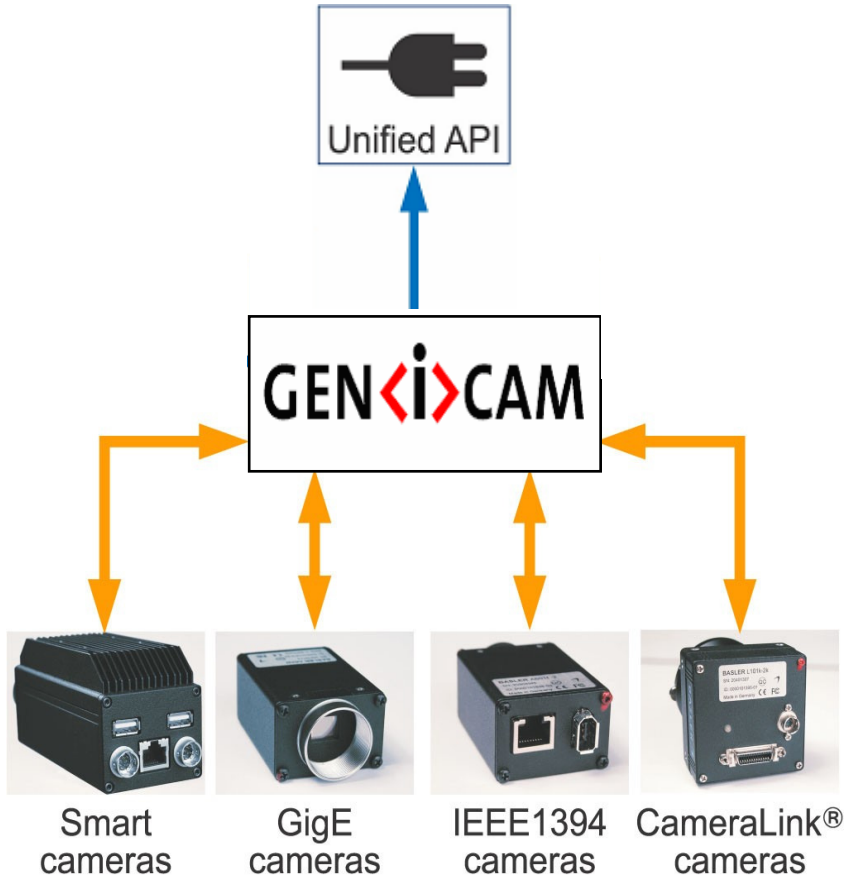
➔ GenICam provides a Unified Programming Interface for machine vision cameras



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GenICam Use Cases

- Configuring the Camera
- Grabbing Images
- Providing a Graphical User Interface
- Delivering Events
- Transmitting Extra Image Data

Customer Viewpoint

Configuring the Camera

Use Case

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User API

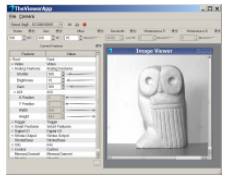
- C++ programming interface

```
if( IsWritable(Camera.Gain) )
      Gamera.Gain = 42;
```

- Provided by freely available GenICam reference implementation
- Other programming languages can be supported, e.g., .NET

Transport Layer API

- Read / Write Register
- Provided by driver vendors (small adapter required)
- Send / Receive ASCII Command extension under planning



User API

Set Gain = 42

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TL API

Write Register
Address, Len, Data

Transport Layer

Interface

1394, GigE Vision,
Camera Link, etc.

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Grabbing Images

Use Case

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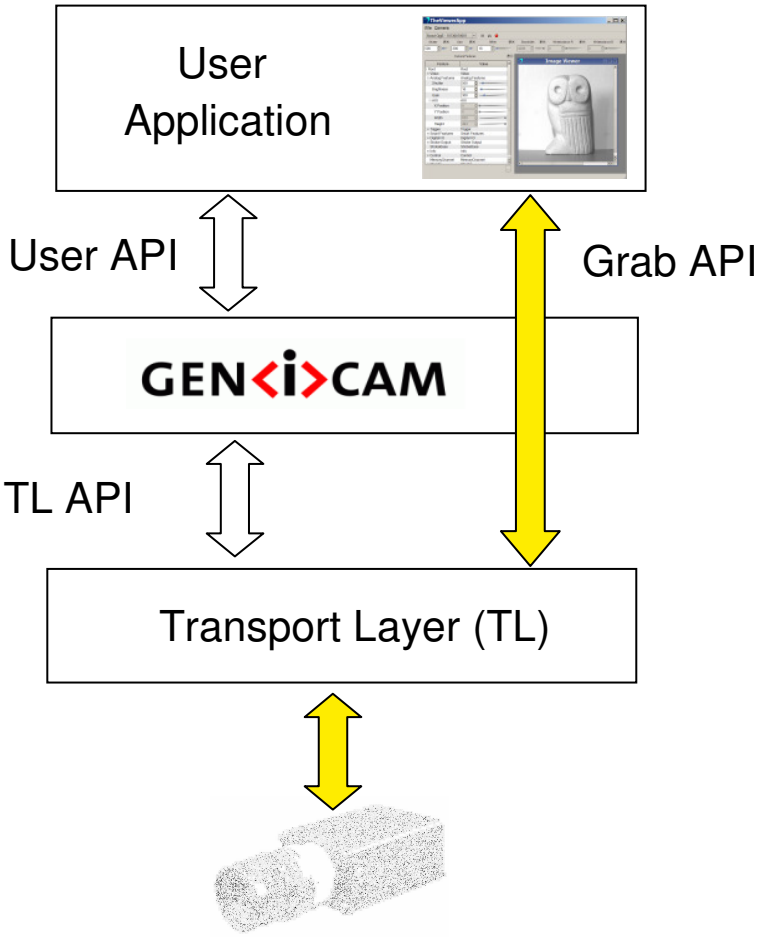
Grab API

- Abstract C++ programming interface
  - `Get device names`
  - `Create camera access object`
  - `Configure camera`
  - `Queue buffers`
  - `Start acquisition`
  - `Wait for buffers`
- Implemented by transport layer DLLs
- Provided by driver vendors (adapter required)
- GenICam provides services to
  - register transport layer DLLs
  - enumerate devices and
  - instantiate camera access objects



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Providing a Graphical User Interface

Use Case

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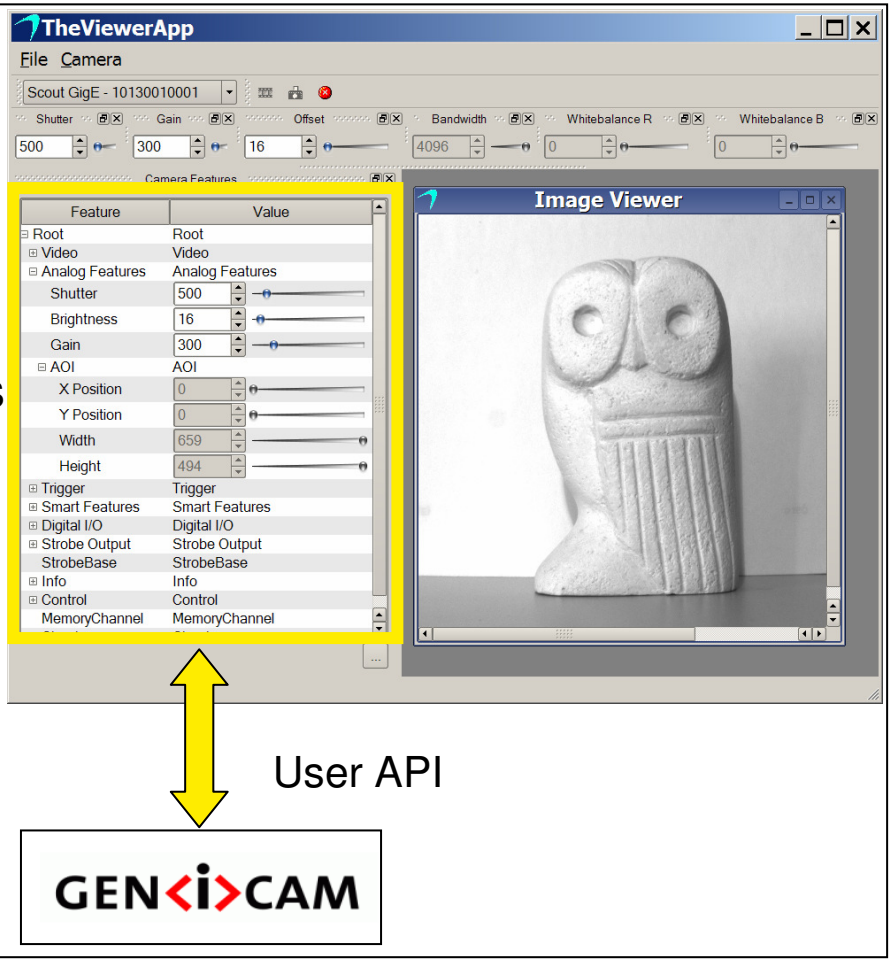
GUI support

- Feature tree
- Widgets support
  - **Slider** → value, min, max
  - **Drop-Down Box** → list of values
  - **Edit Control** → From/ToString
  - etc.
- Access mode information
  → RW, RO, WO, …
- Full model / view support
  → callback if a feature changes



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Delivering Events

Use Case

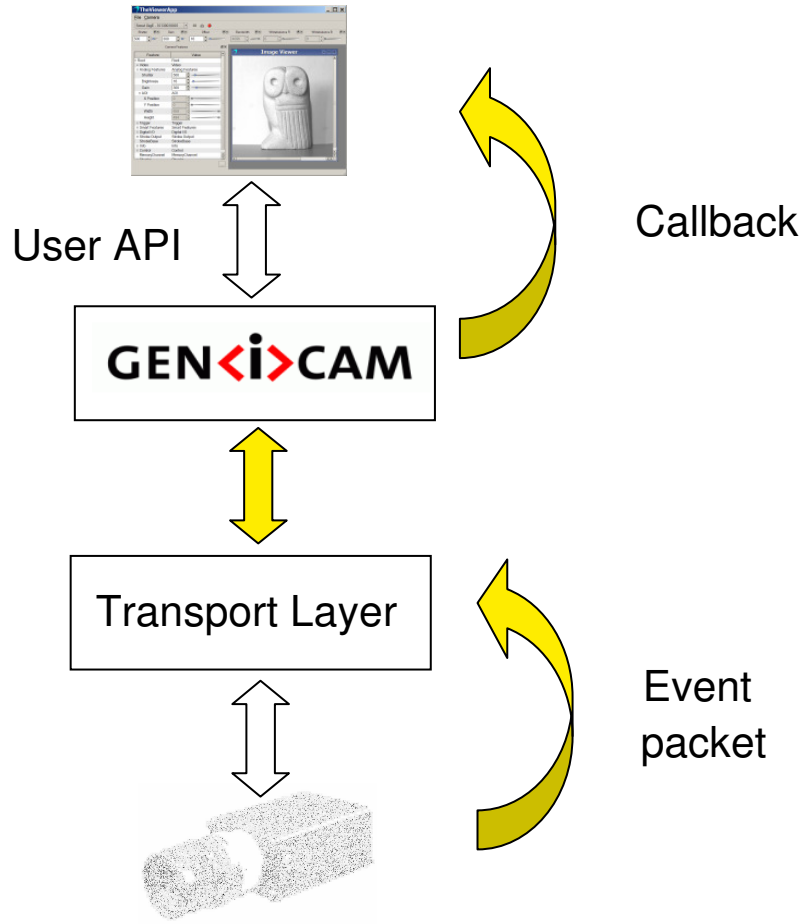
Asynchronous Callbacks

- Cameras can deliver event packets, e.g. when the exposure has finished
- Users can register a callback

```
void Callback( INode* pNode )
{ printf("Hi!"); }

Register( Camera.ExposureEnd,
      &Callback );
```

- Events are identified by an EventID
- If an event packet arrives GenICam fires a callback on all nodes with matching EventID
- Data coming with events is also delivered.



Transmitting Extra Image Data

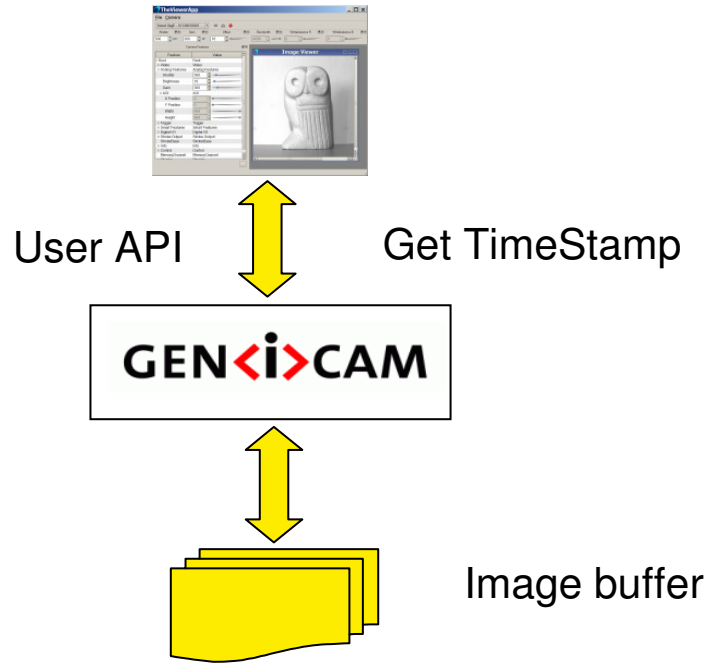
Use Case

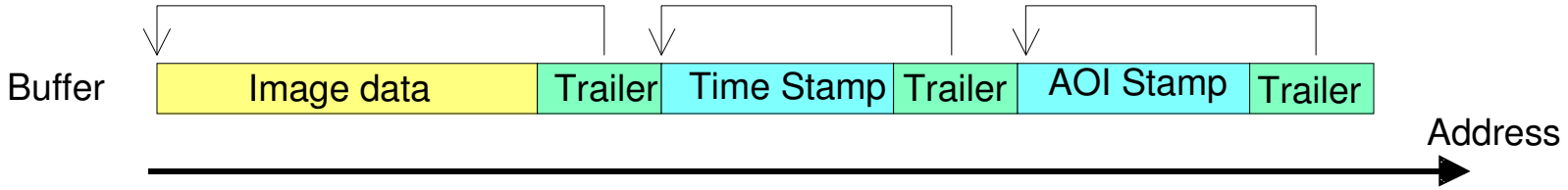
Chunked Data Stream

- Images can have chunks of additional data appended, e.g. a time stamp.
- GenICam makes this data accessible

```
if( IsReadable( Camera.TimeStamp ) )
      cout << Camera.TimeStamp();
```

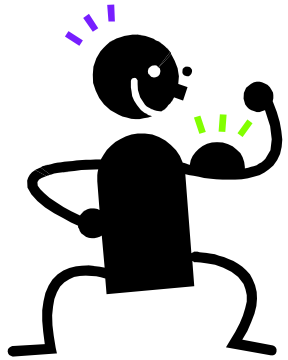
- The transport layer “shows” each buffer to GenICam.
- GenICam interprets the chunks as read only registers identified by a ChunkID





Making GenICam Compatible Products

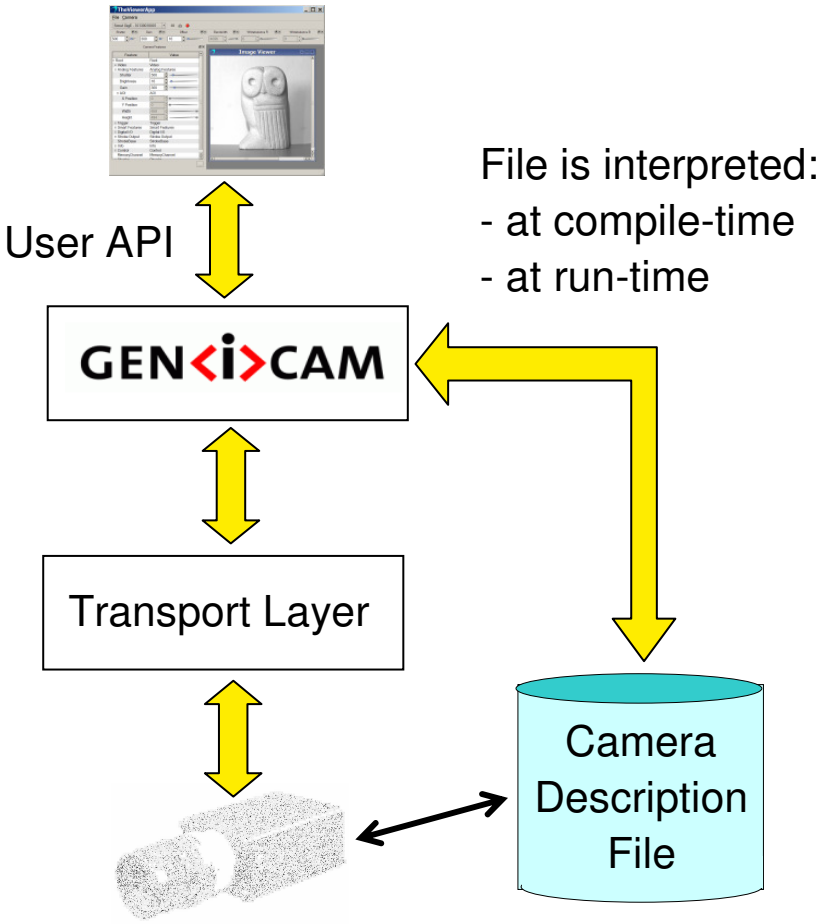
- Features
- Making Cameras Interchangeable
- Reference Implementation
- License Issues



Vendor Viewpoint

Camera Description File

- Describes how features (“Gain”) map to registers (or commands)
- XML format with a syntax defined in the GenICam standard
- Static use case : a code generator creates a camera specific C++ class at compile-time
- Dynamic use case : the program interprets the XML file at run-time
- Camera description files are provided by the camera vendor



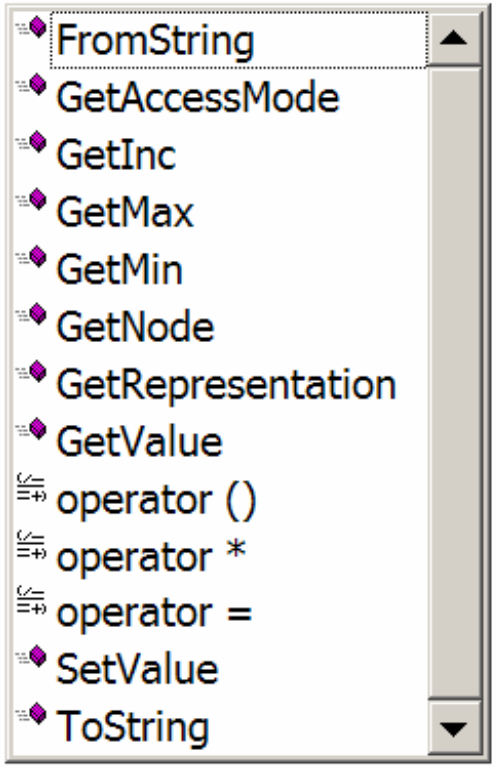
Feature Types

- Each feature has a type that is defined by an abstract interface
- Common types with associated controls are:
  - Integer, Float ⇔ slider
  - String ⇔ edit control
  - Enumeration ⇔ drop down box
  - Boolean ⇔ check box
- With GenICam camera vendors can use whatever feature names, types and behavior they like.
- As a consequence GenICam alone does not make cameras interchangeable!

  ➔ **Standard Feature List** is required

Example: Integer interface

```
Camera.Gain.
```



Standard Feature List

For **GigE Vision** cameras a list of ~**180** standard features is provided.

- This list is organized along use cases:
  - Image size control
  - Acquisition and trigger controls
  - Digital IO
  - Analog Controls
  - …
- Only 7 features are mandatory, the others are just recommended

- The GigE Vision standard says

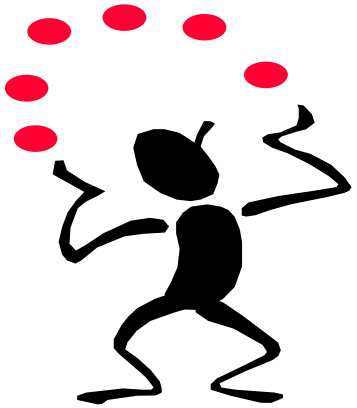
  *…any GigE Vision device **MUST** provide an XML device description file compliant to the syntax of the GenApi module of GenICam™.*

For **1394 IIDC** cameras the same list of features can be used with only a few adaptations.

- A common XML file is still under construction

GenICam Organization

- Standard Committee
- Supporting Companies
- Status & Roadmap
- Benefits



Industry Viewpoint

GenICam Standard Committee

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- GenICam is hosted by the European Machine Vision Association (EMVA)
- **Contributing members** are working(!) on the standard and the reference implementation. Only contributing members can **vote**.
- **Associated members** agree to the GenICam rules. They get full access to the source code and are placed on the mailing list but **cannot vote**.
- **Interested outsiders** get the GenICam run-time and the released standard documents
- You can **register** at www.genicam.org

Contributing Members
- currently 8 companies -

Associated Members
- currently 20 companies -

Interested Outsiders

no fees!

*) as of b/o May 2006

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GenICam Members

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Status*) and Roadmap

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GenApi Module

- Standard and reference implementation v1.0 are released and are available on www.genicam.org.
- The number of GenICam aware products is constantly growing. Among them are:
  - All GigE Vision compliant cameras
  - Many of the image procession software libraries
  - Some 1394 cameras

GenTL Module

- Defined interfaces and working adapters for GigE Vision, 1394, and Camera Link
- Draft standard expected Q1 2007

Standard Feature List

- GigE Vision : v1.0 is released
- 1394 IIDC : under construction

*) cw36 / 2006

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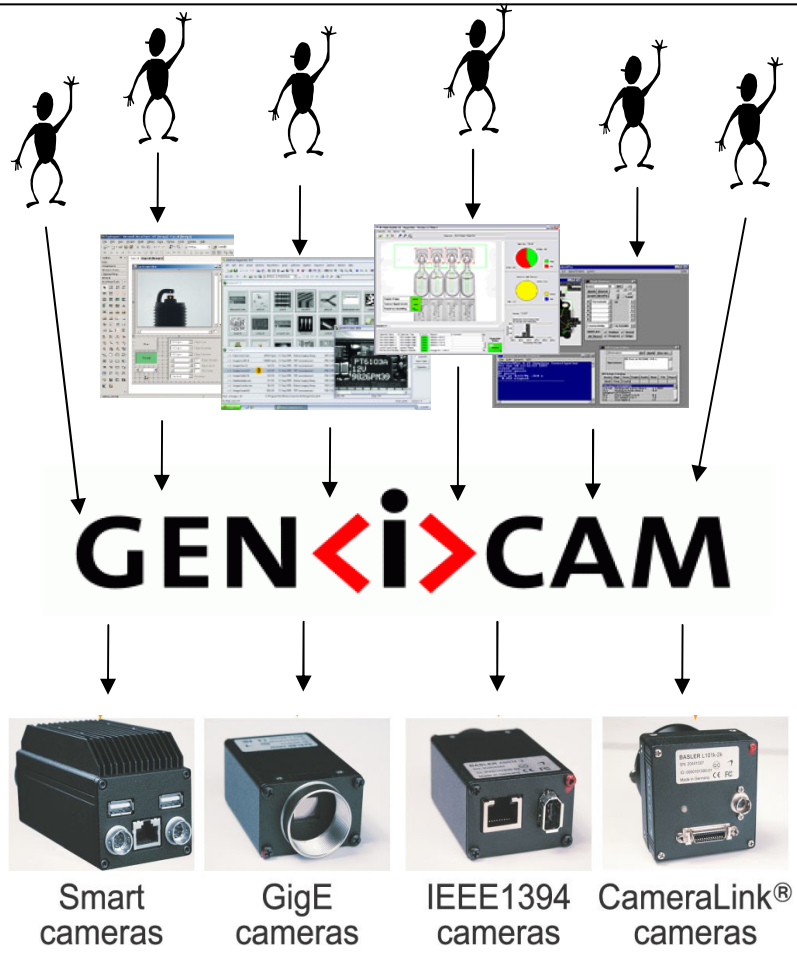
Benefits



Customers

- Combine
  → any camera with
  → any smart feature with
  → any software library
- Mix interface technologies and cameras from different vendors

Vendors

- Enlarge your market
- Reduce your cost
- Speed up time-to-market

Thank you for your attention!

Contact me ➔ friedrich.dierks@baslerweb.com

Get information ➔ www.genicam.org