Macoun'10

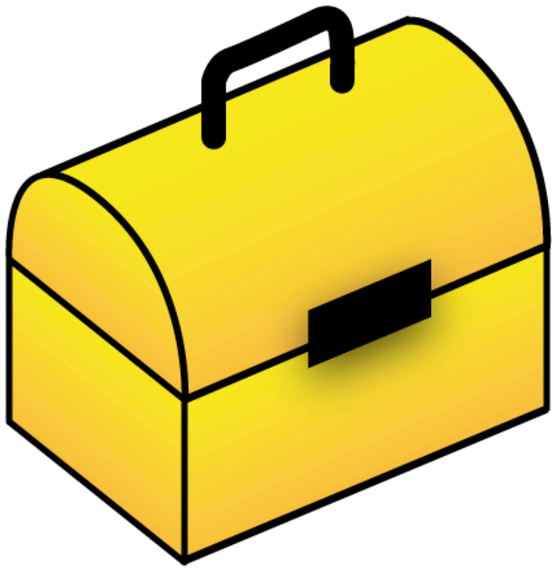
Umdenken in OpenCL

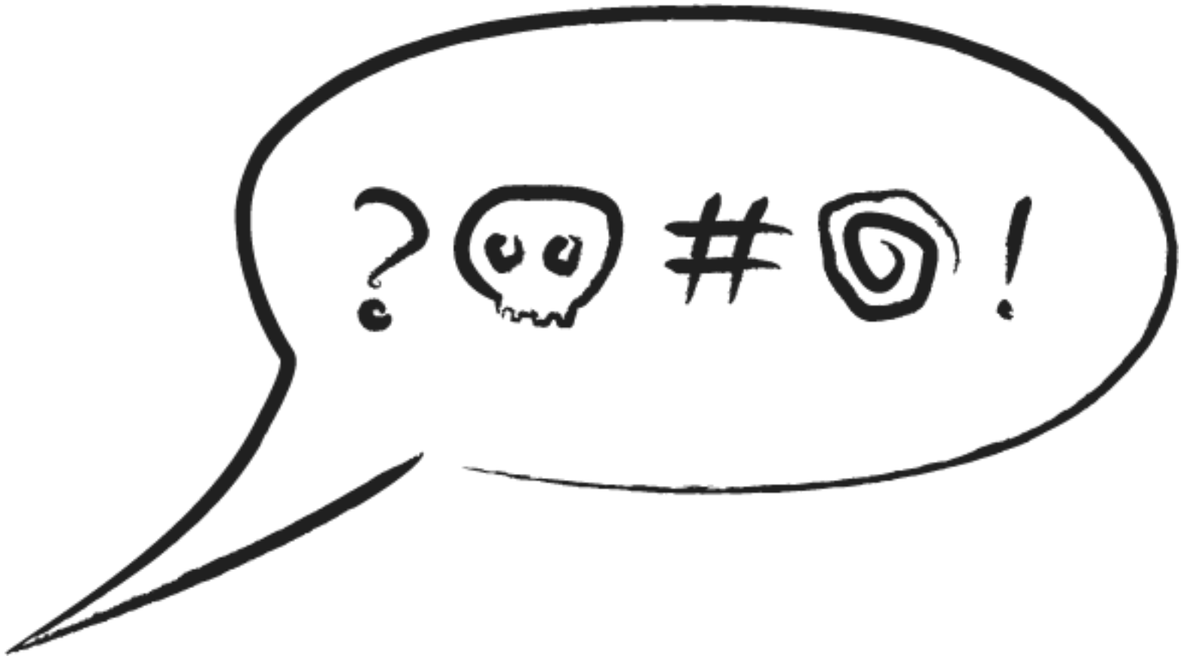
Eberhard Rensch

Ablauf

- Vorspeise: Grundlagen von OpenCL
- Hauptgericht

Was ist OpenCL

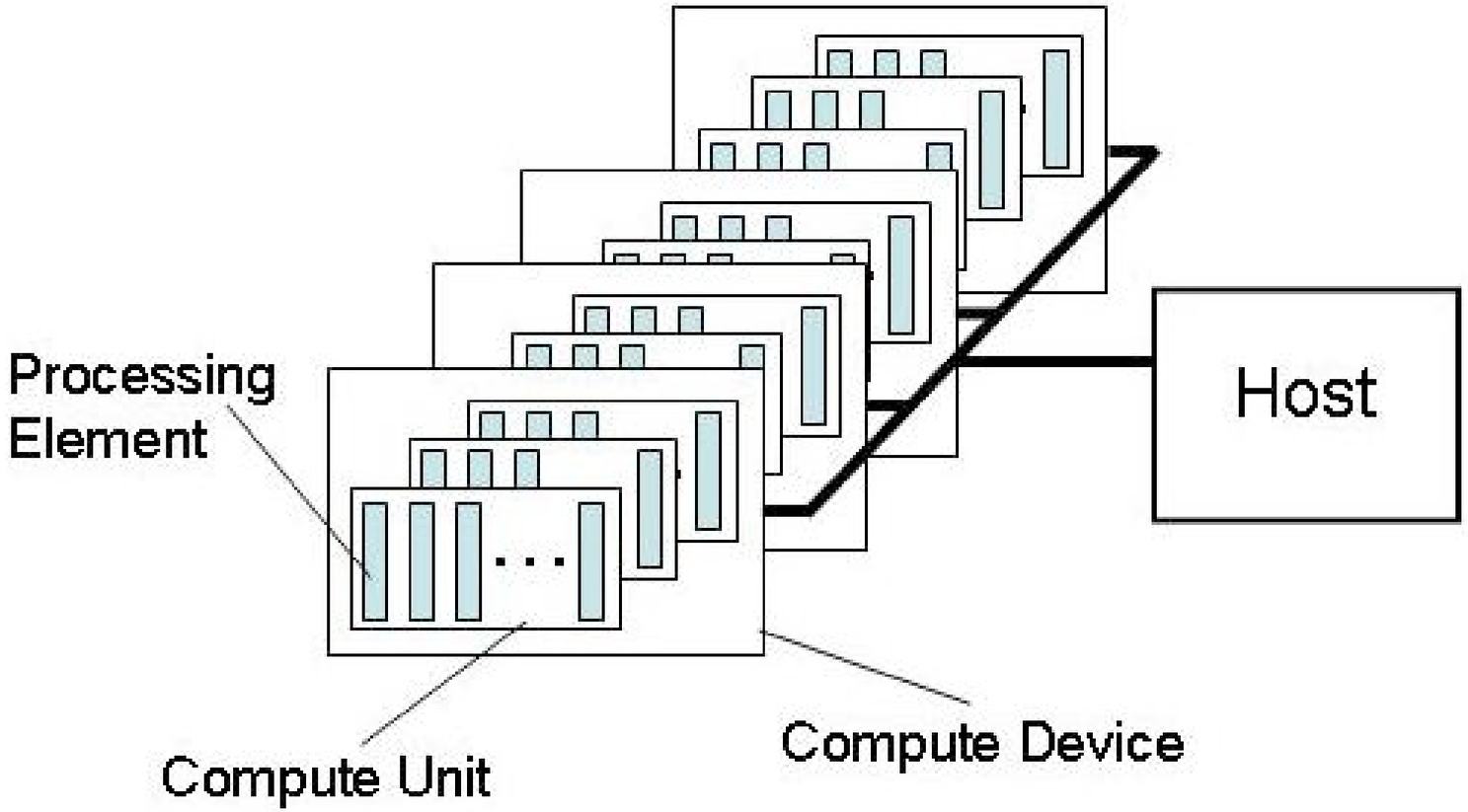




Was ist OpenCL

- http://www.khronos.org/opencl/
- OpenGL, OpenAL, OpenCL
- OpenCL-Programm Infrastruktur erinnert OpenGL GLSL-Shader-Programm Infrastruktur

OpenCL Plattform



Runtime OpenCL

```
cl_device_id device_id;
err = clGetDeviceIDs(NULL,
             useGPU ? CL_DEVICE_TYPE_GPU : CL_DEVICE_TYPE_CPU,
             1, &device_id, NULL);
```

Runtime OpenCL

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Demo

Runtime OpenCL

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cl_device_id device_id;
err = clGetDeviceIDs(NULL,
            useGPU ? CL_DEVICE_TYPE_GPU : CL_DEVICE_TYPE_CPU,
            1, &device_id, NULL);
```

```
cl_context context = clCreateContext(0, 1, &device_id, NULL, NULL, &err);
```

Runtime OpenCL

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            1, &device_id, NULL);
```

```
cl_context context = clCreateContext(0, 1, &device_id, NULL, NULL, &err);
```

```
cl_command_queue queue = clCreateCommandQueue(context, device_id, 0, &err);
```

Runtime OpenCL

```
cl_program program = clCreateProgramWithSource(context, 1,
                                               (const char **) source, NULL, &err);
```

Runtime OpenCL

```
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                                                (const char **) source, NULL, &err);
```

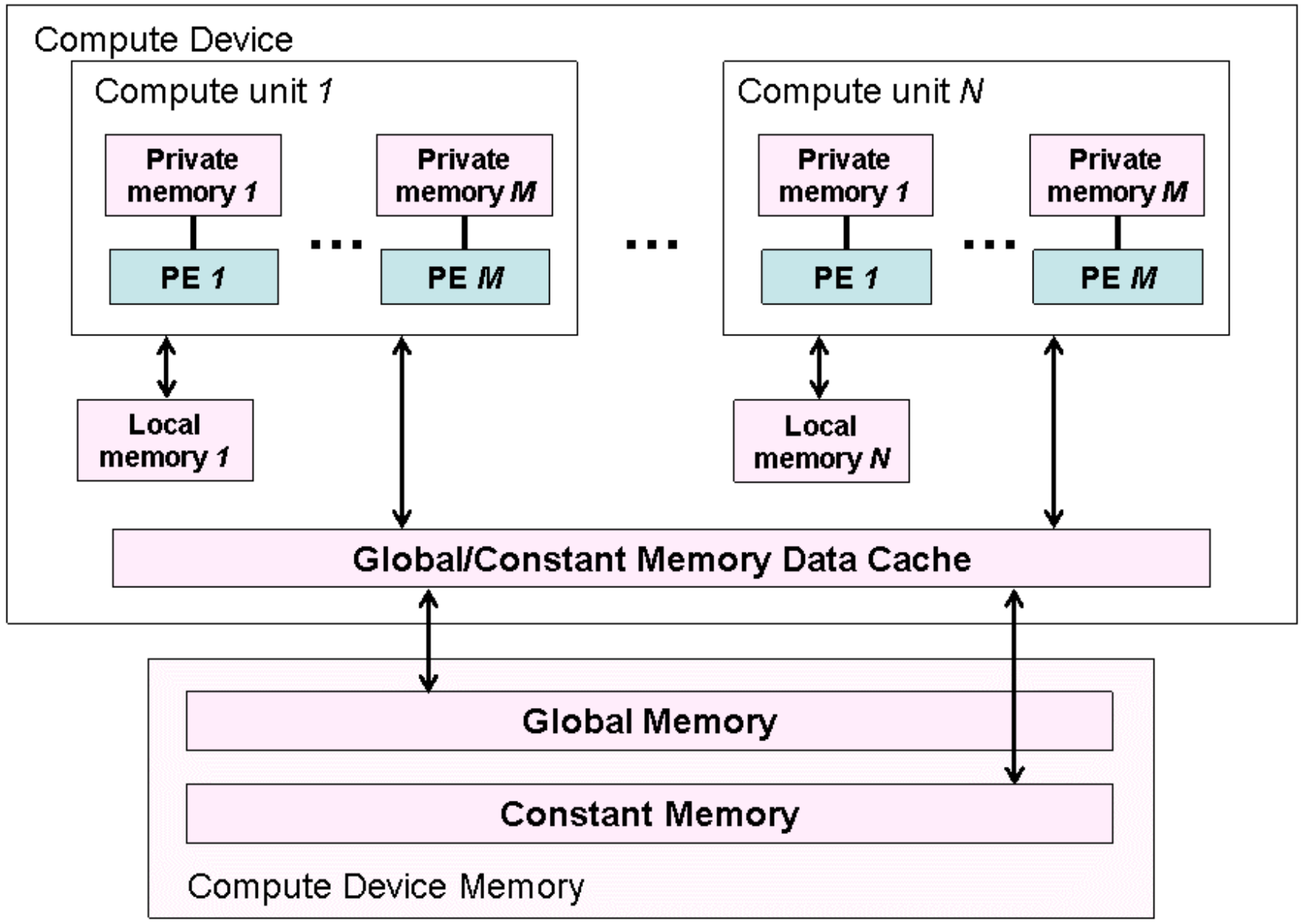
Runtime OpenCL

```
cl_program program = clCreateProgramWithSource(context, 1,
                                               (const char **) source, NULL, &err);
```

```
 err = clBuildProgram(program, 0, NULL, NULL, NULL, NULL);
```

Demo

Speichermodell OpenCL



Speichermodell OpenCL

```
cl_mem buffer = clCreateBuffer(queue,  CL_MEM_READ_WRITE,
                                       sizeof(cl_float) * count, NULL, NULL);
```

Speichermodell OpenCL

```
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                                       sizeof(cl_float) * count, NULL, NULL);
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Speichermodell OpenCL

```
cl_mem buffer = clCreateBuffer(queue,  CL_MEM_READ_WRITE,
                                       sizeof(cl_float) * count, NULL, NULL);
```

```
err = clEnqueueWriteBuffer(queue, buffer, CL_FALSE, 0,
                           sizeof(cl_float) * count, daten, 0, NULL, NULL);
```

Speichermodell OpenCL

```
cl_mem buffer = clCreateBuffer(queue,  CL_MEM_READ_WRITE,
                                       sizeof(cl_float) * count, NULL, NULL);
```

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                           sizeof(cl_float) * count, daten, 0, NULL, NULL);
```

```
err = clEnqueueReadBuffer( queue, outputBuffer, CL_TRUE, 0,
                         sizeof(cl_float) * count, ergebnisse, 0, NULL, NULL );
```

Speichermodell OpenCL

```
cl_mem buffer = clCreateBuffer(queue,  CL_MEM_READ_WRITE,
                                       sizeof(cl_float) * count, NULL, NULL);
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err = clEnqueueWriteBuffer(queue, buffer, CL_FALSE, 0,
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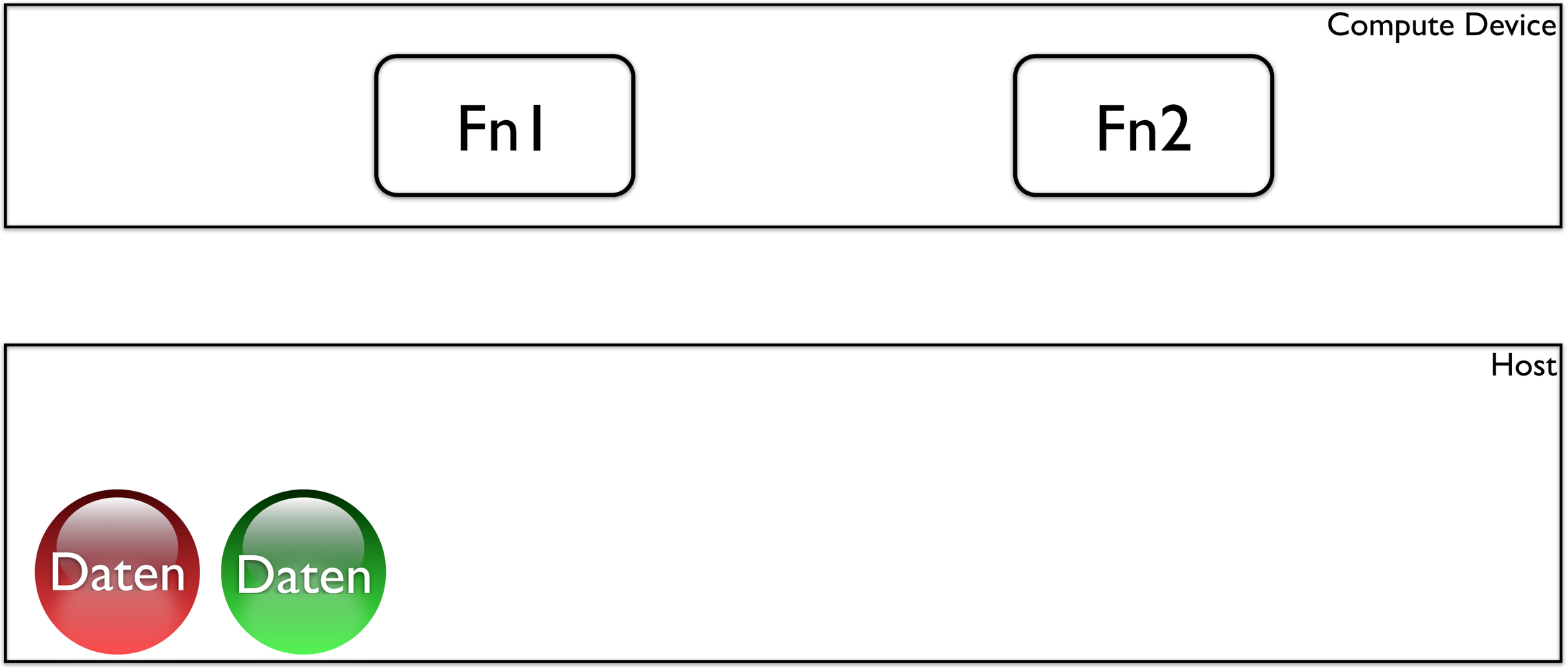
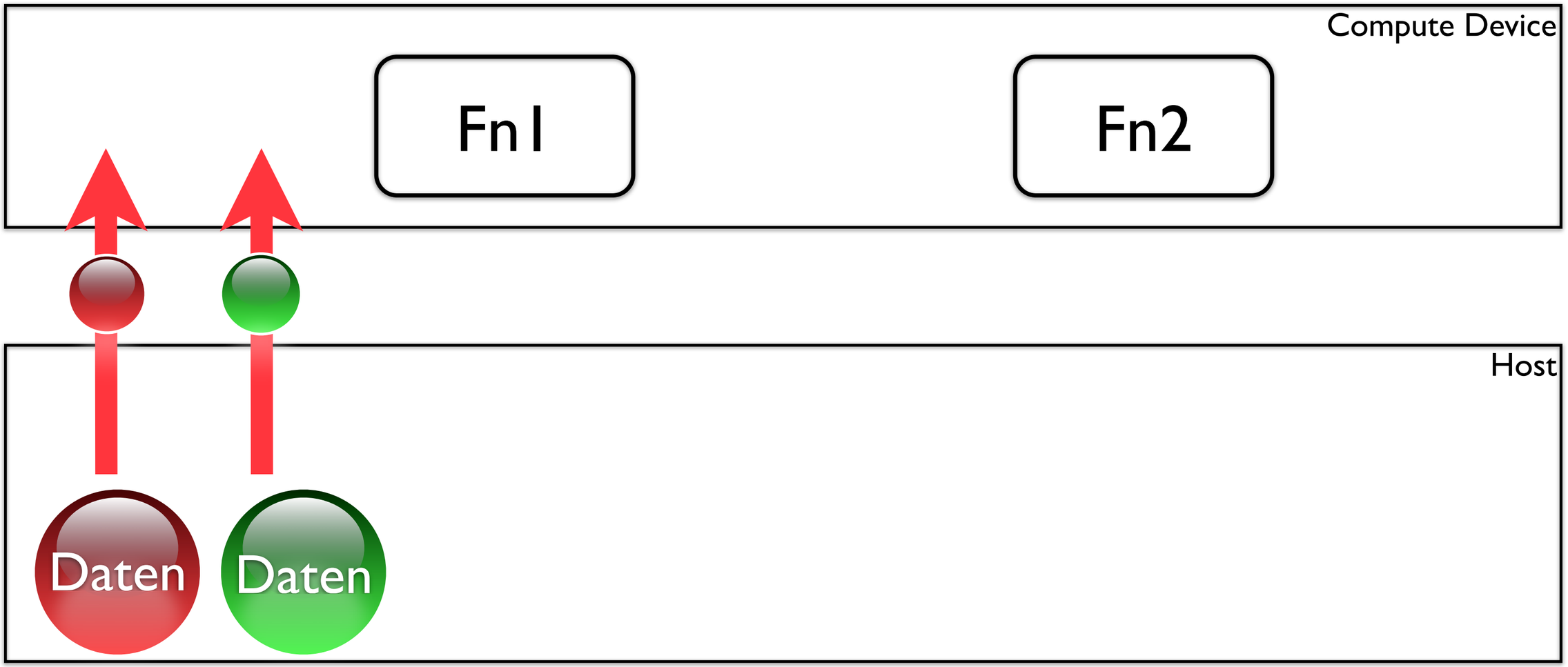
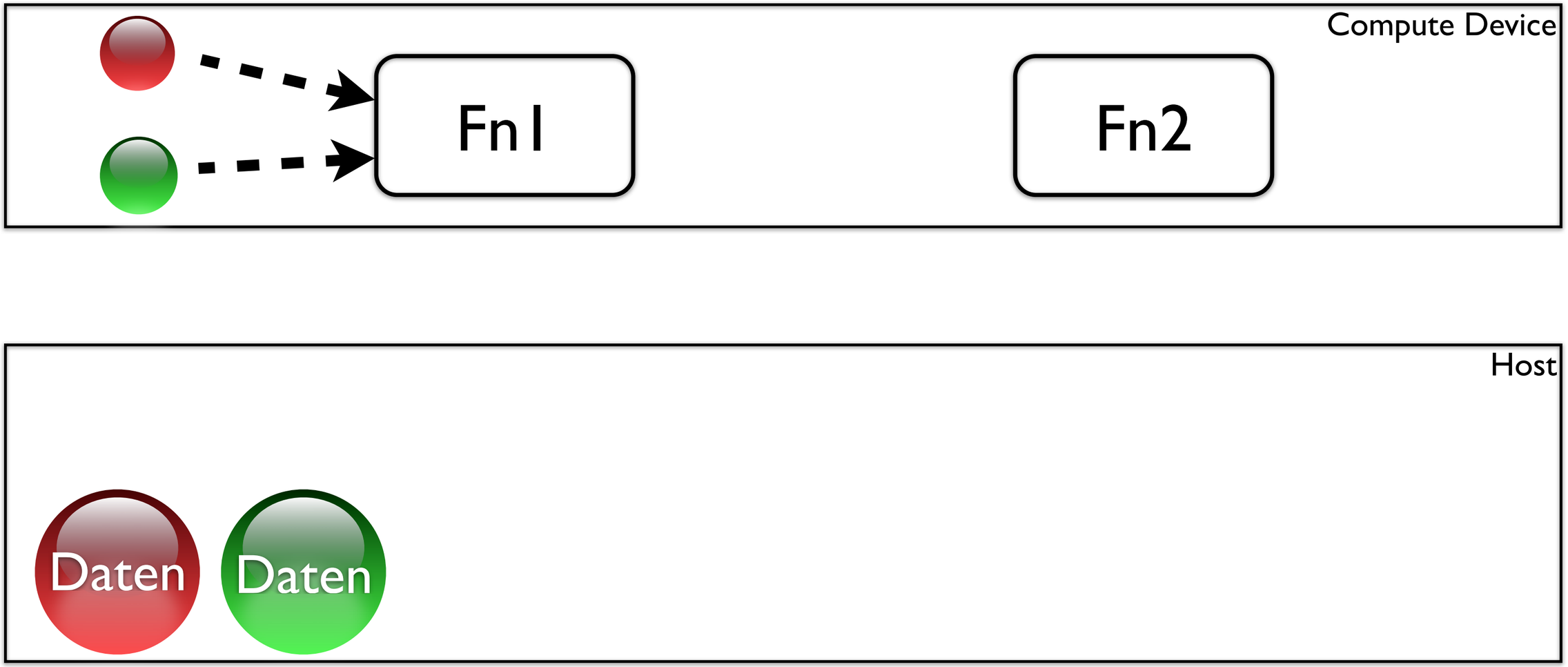


Speichermodell OpenCL



Speichermodell OpenCL



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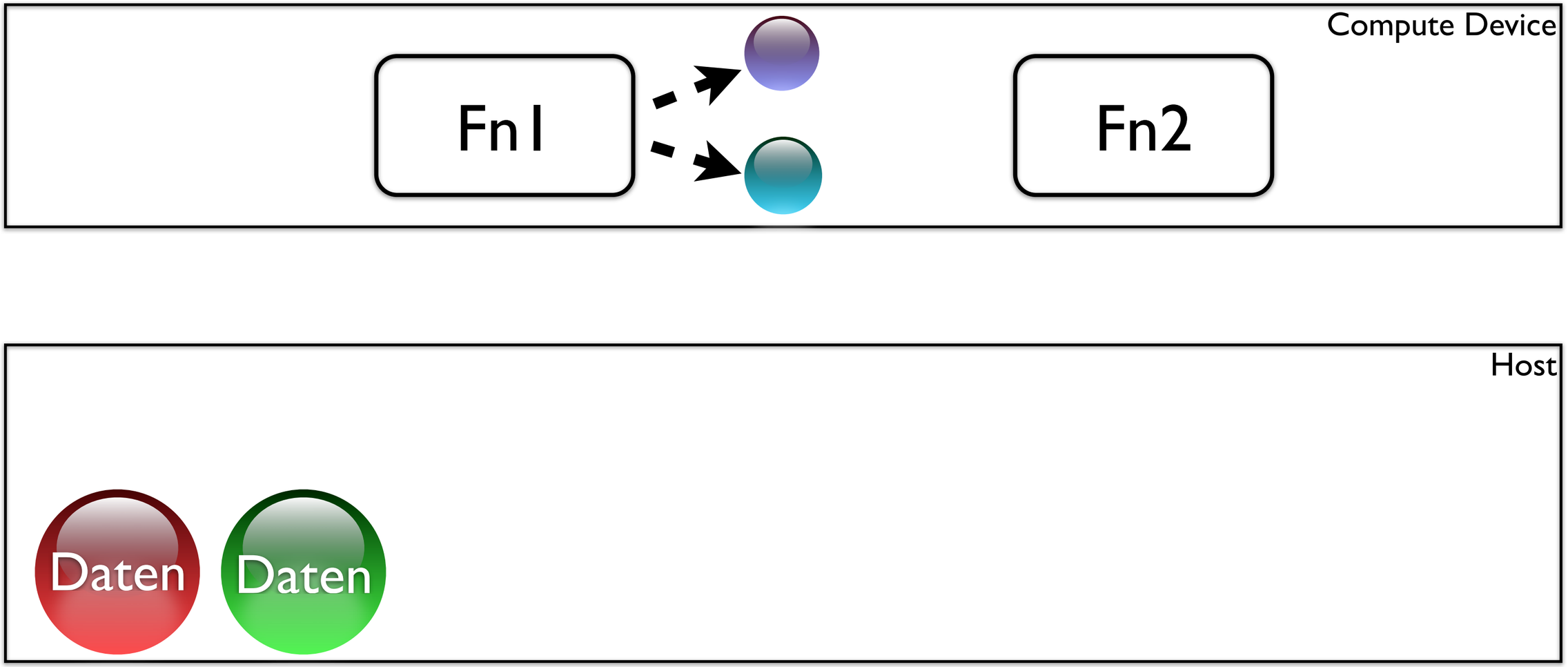
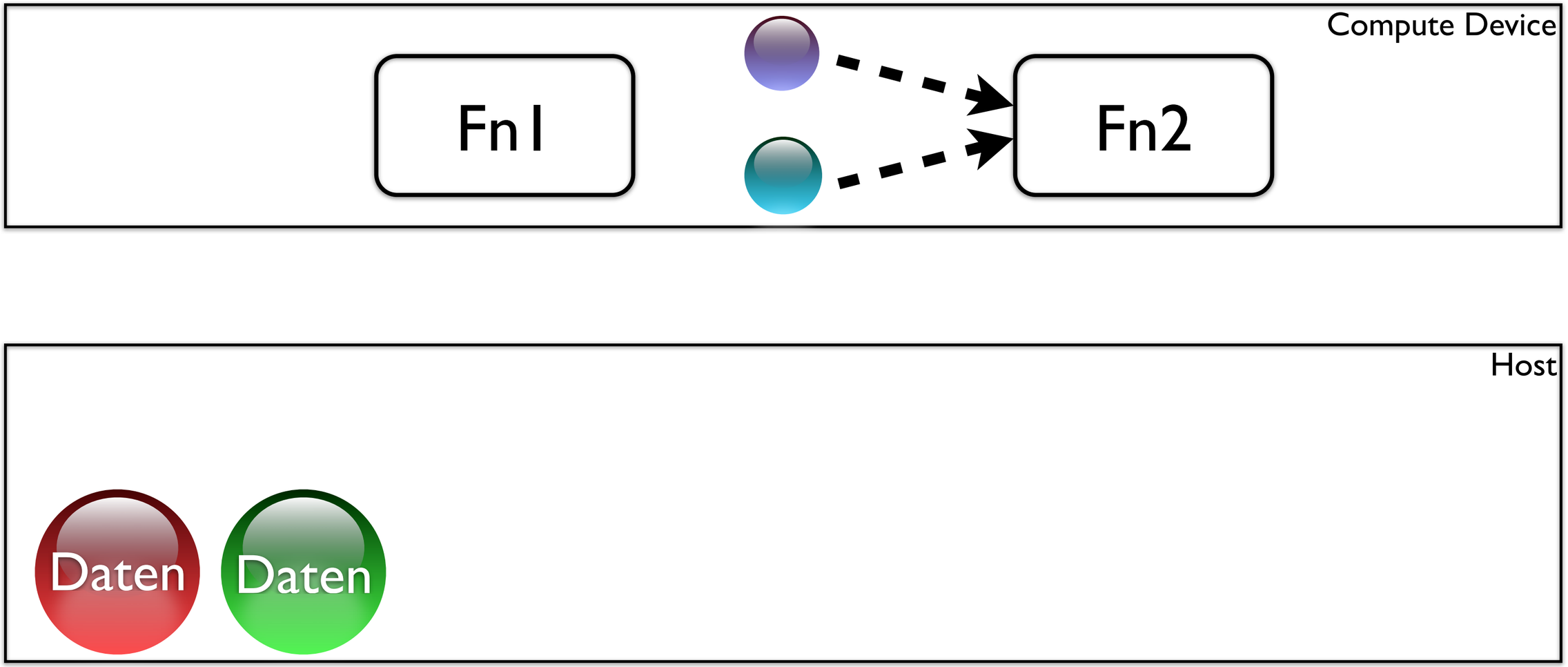


Speichermodell OpenCL



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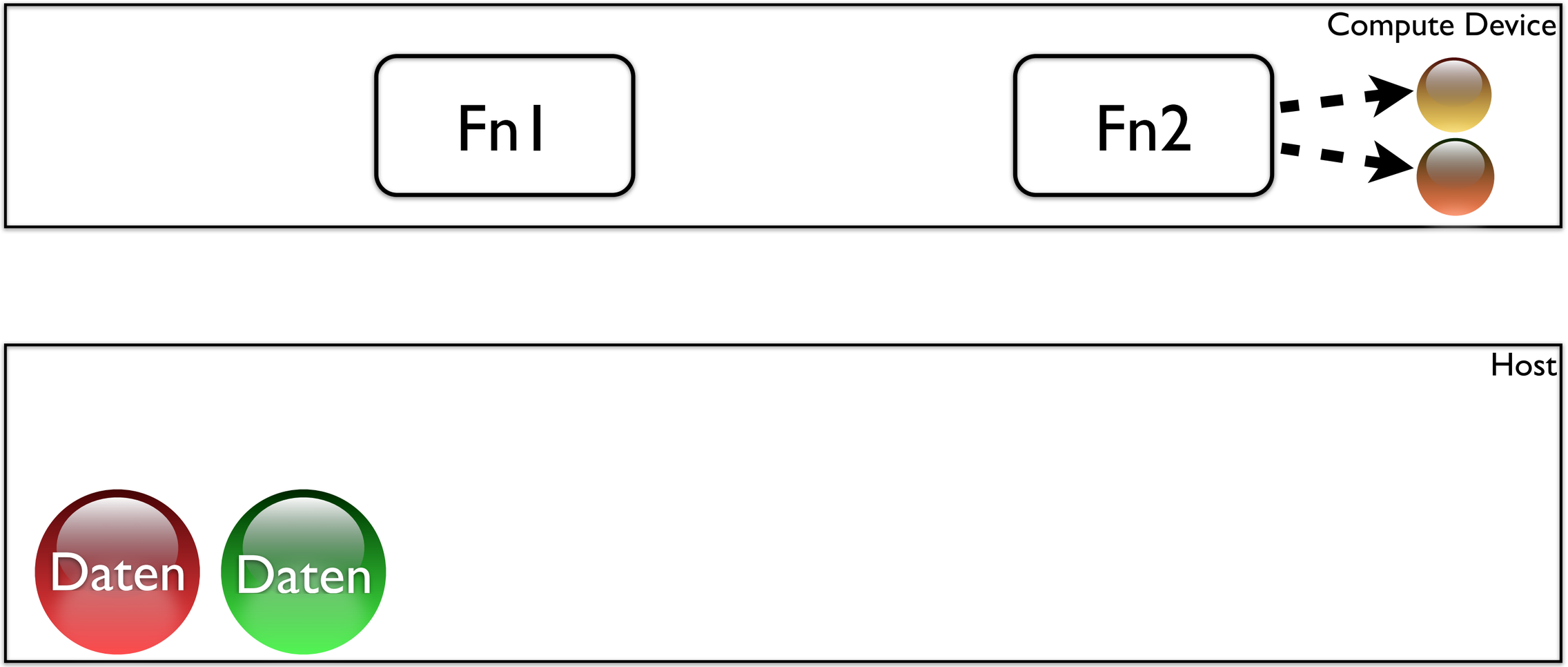

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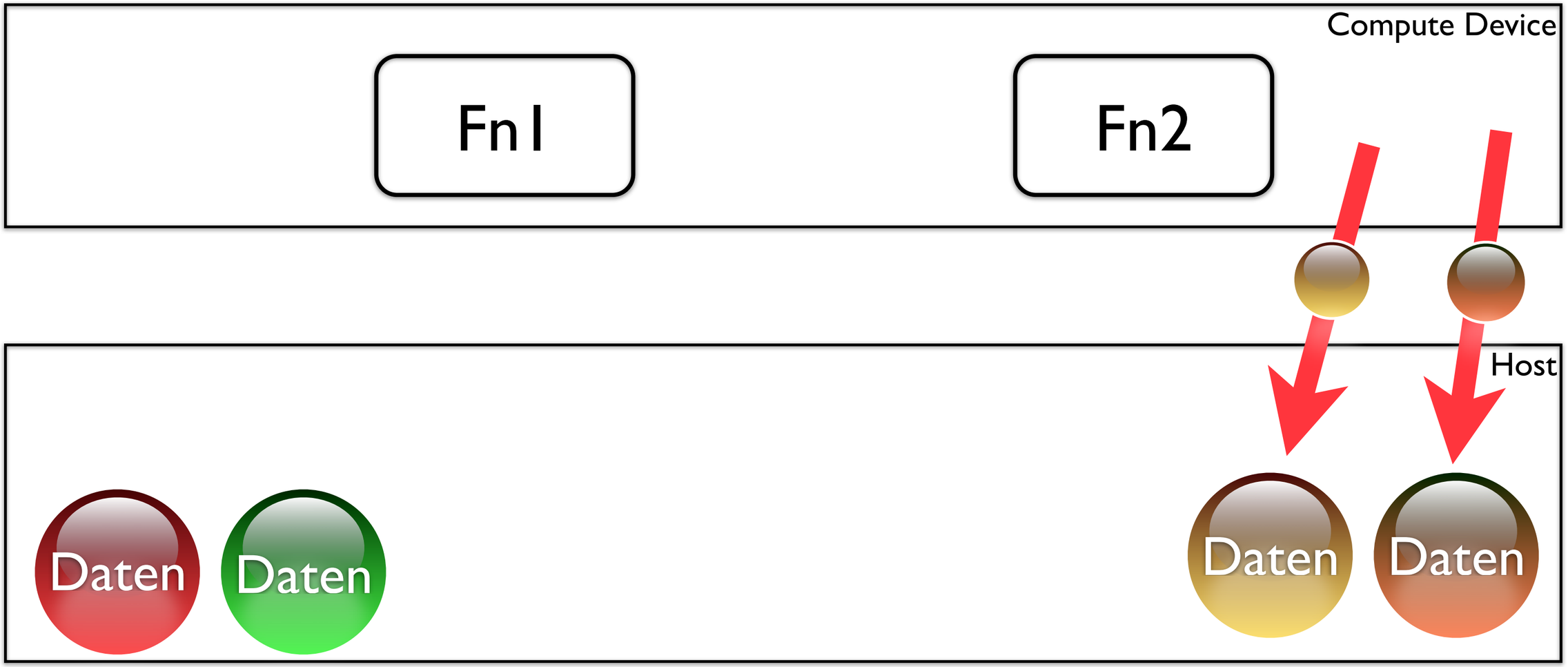

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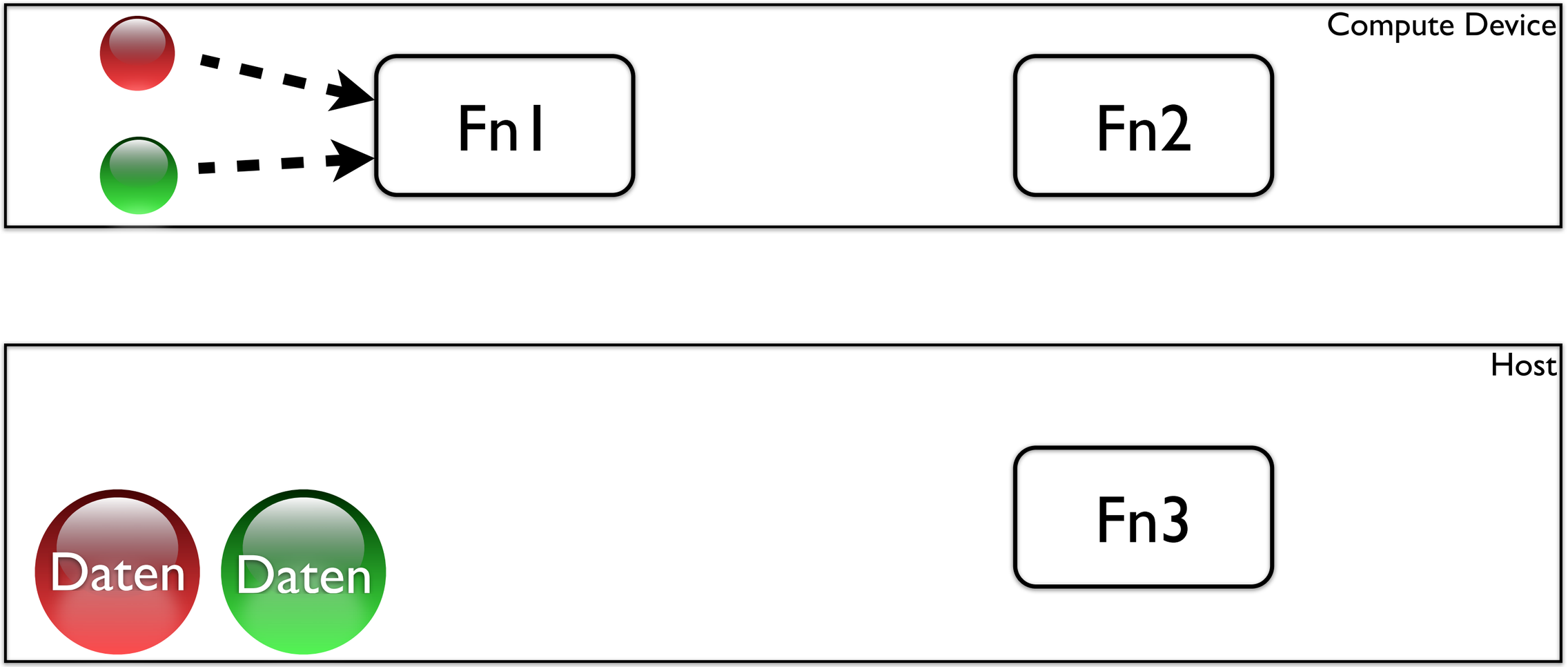

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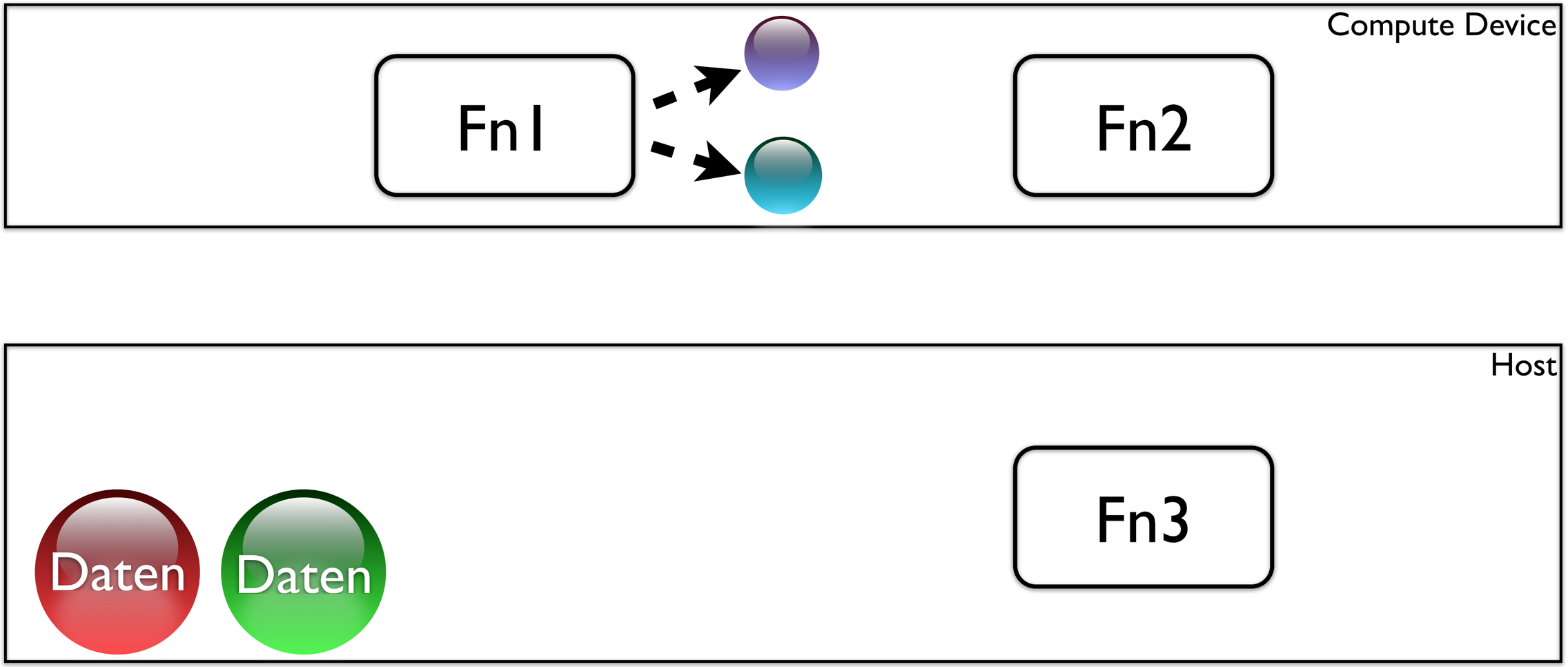

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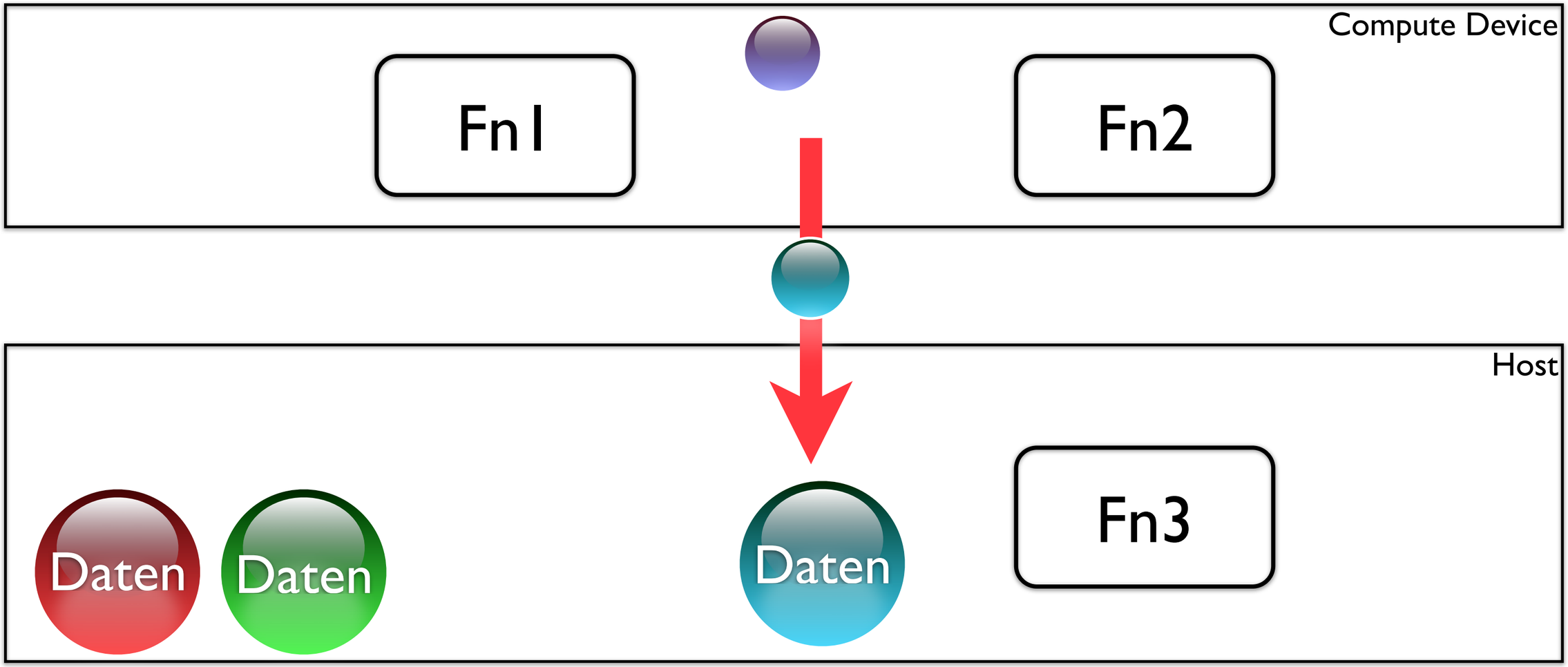

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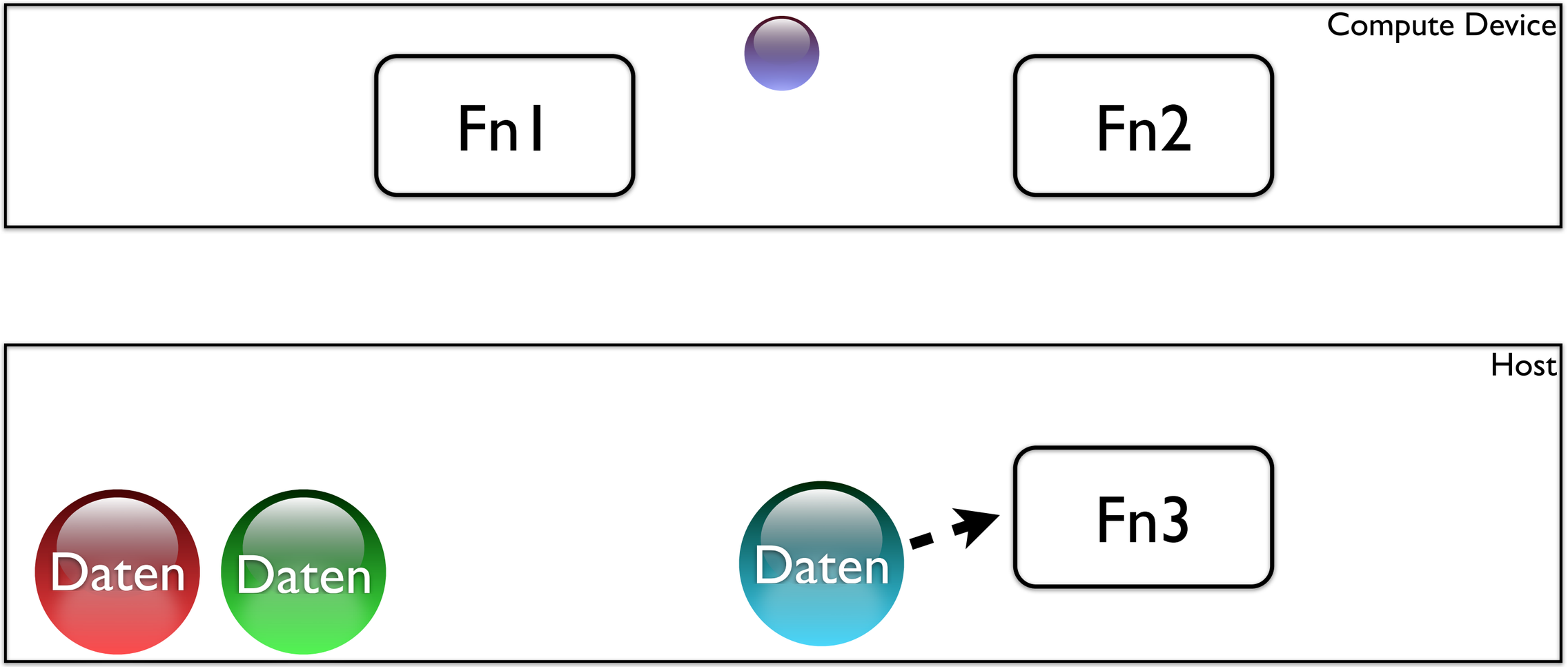

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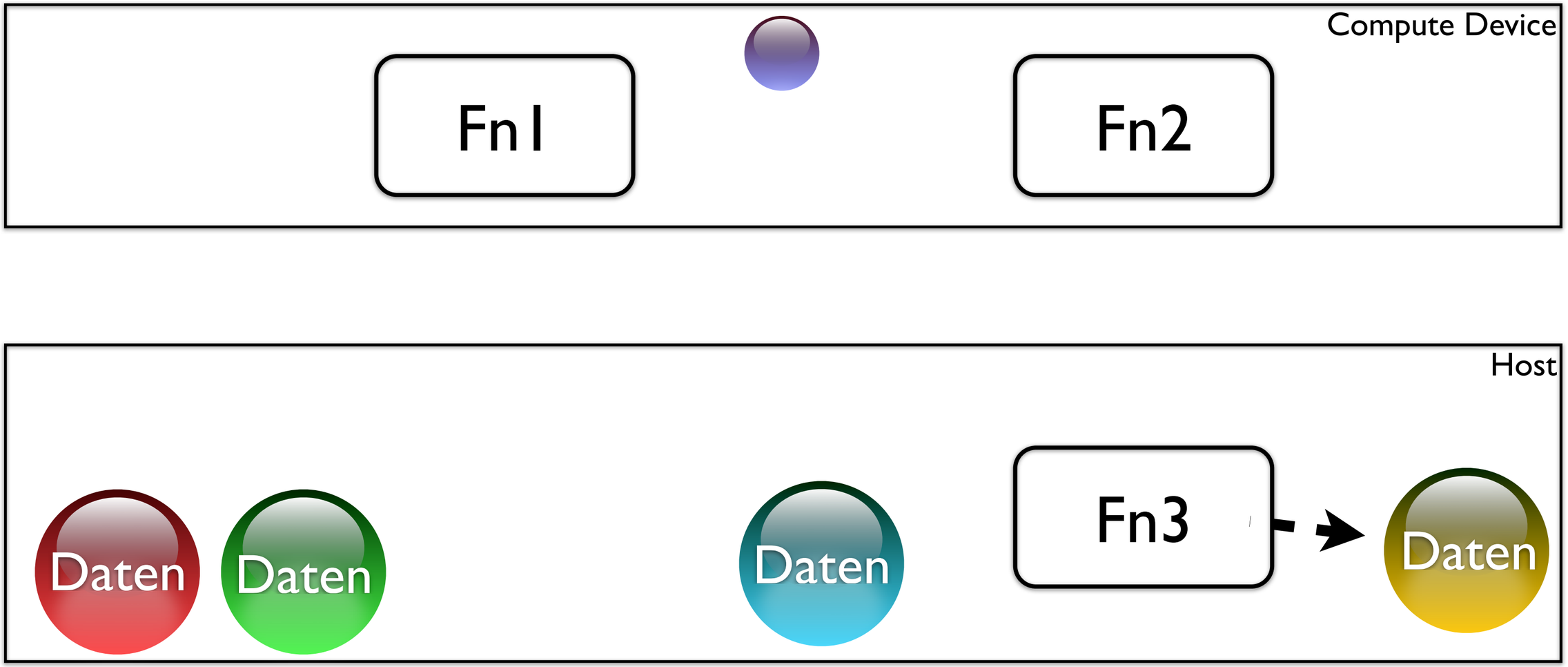

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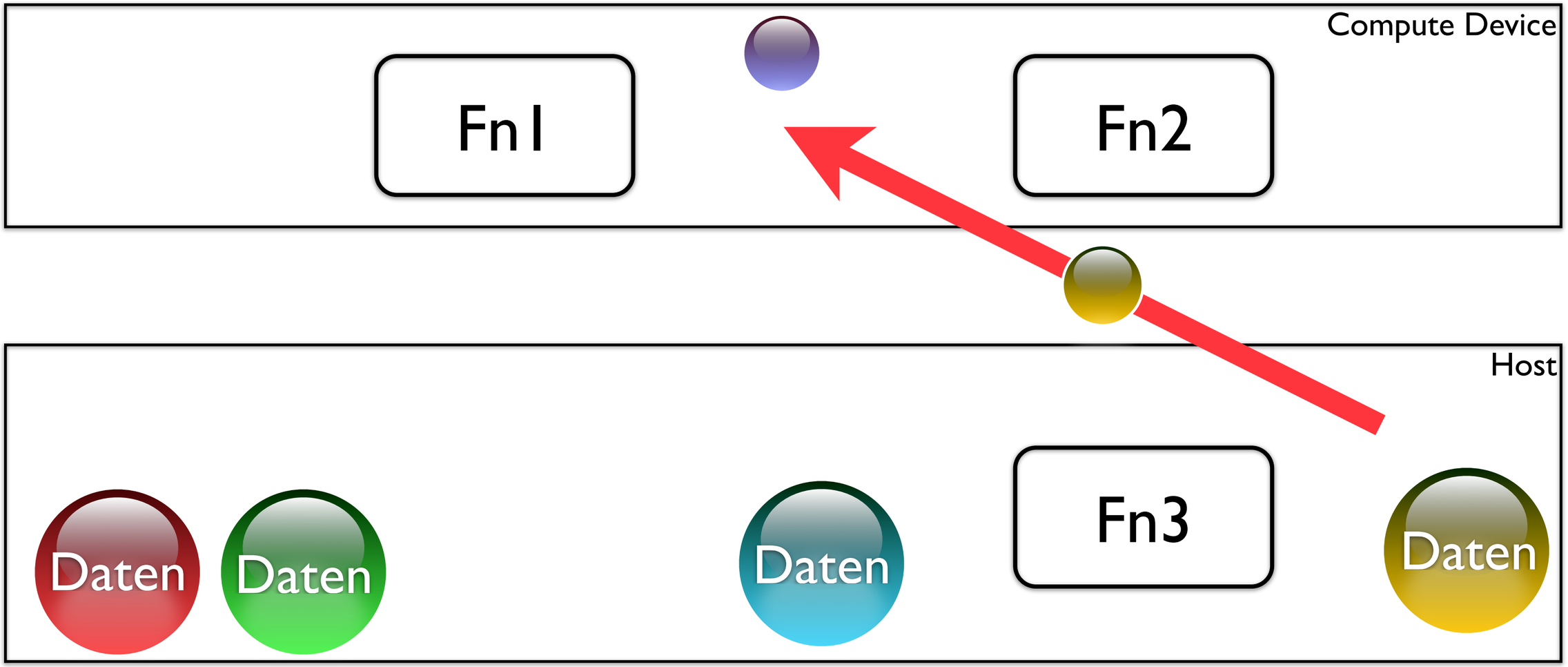

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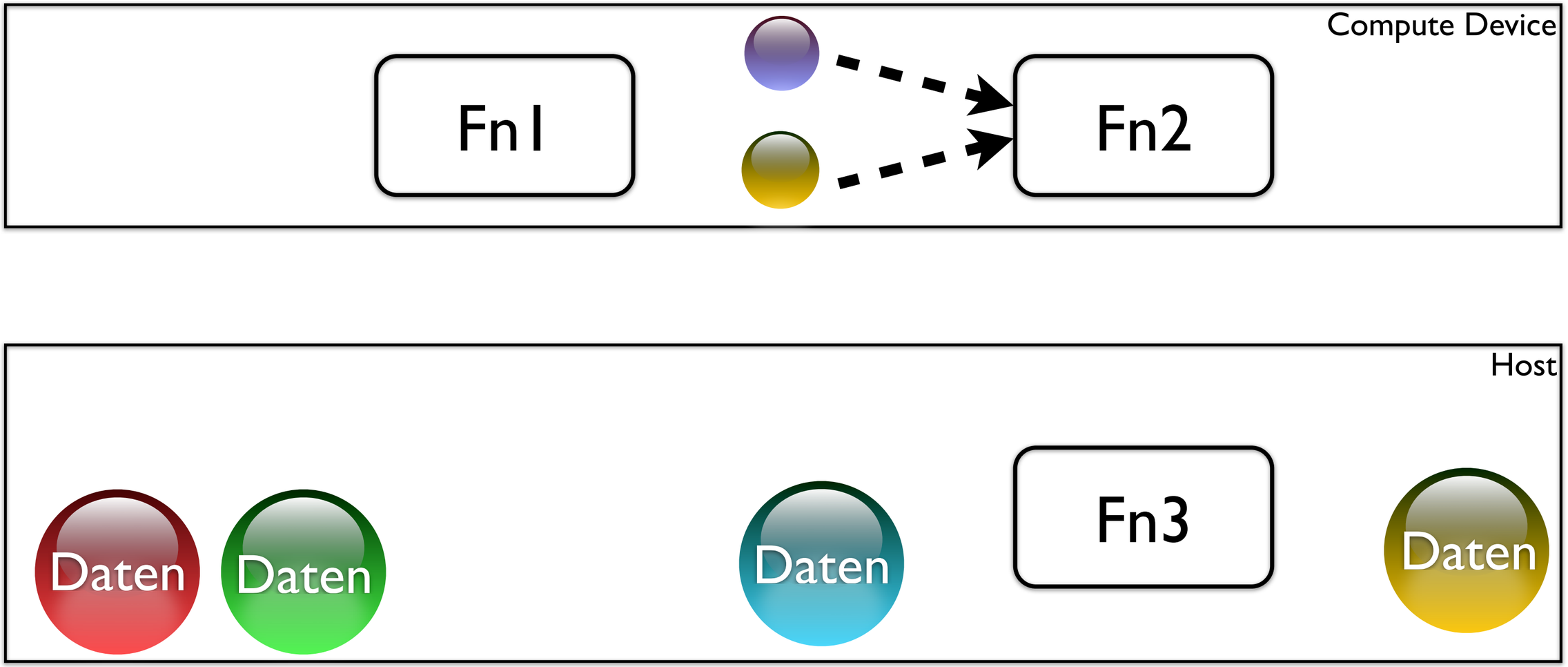


Demo

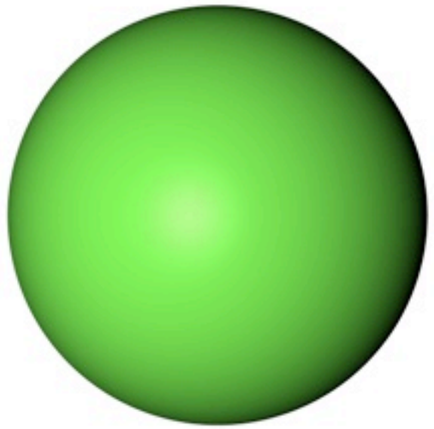
Hauptgericht

Think big

Think many

Think many:
So viele wie möglich
gleiche Operationen auf
verschiedene Objekte
(und zwar parallel!)

Der Slice-Algorithmus



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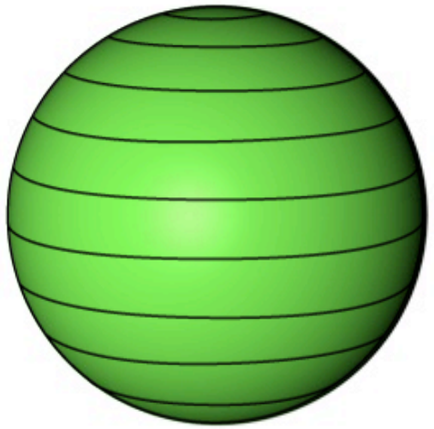

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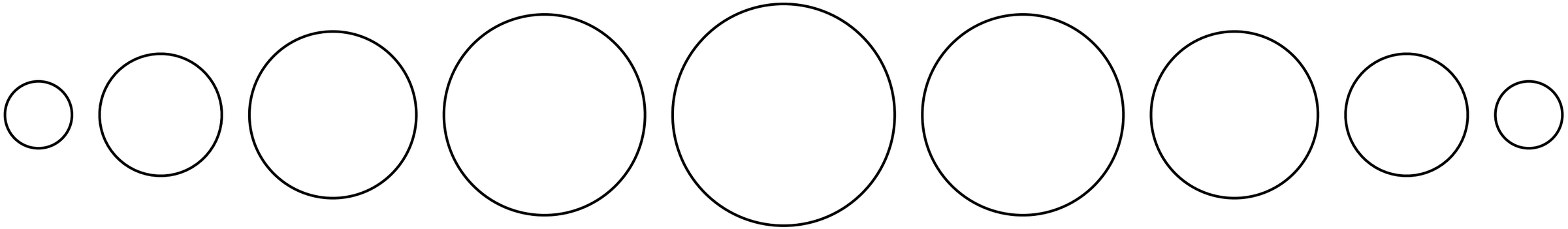

Der Slice-Algorithmus

- Index für Dreiecke anlegen
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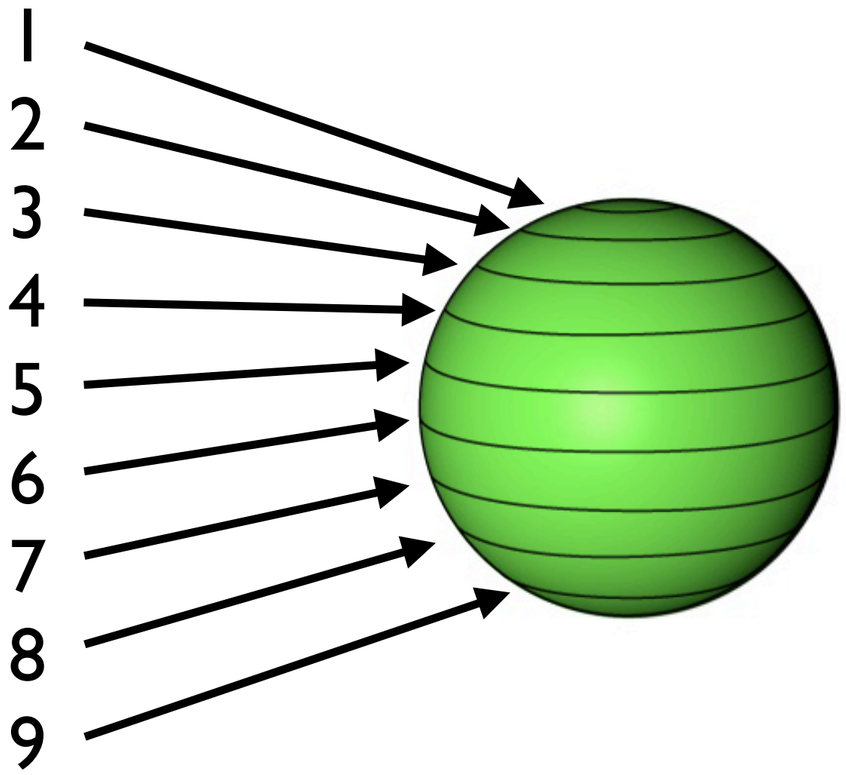

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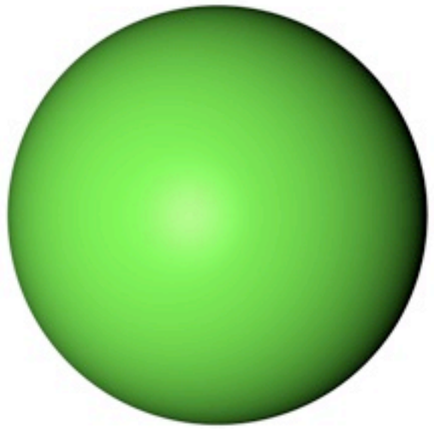

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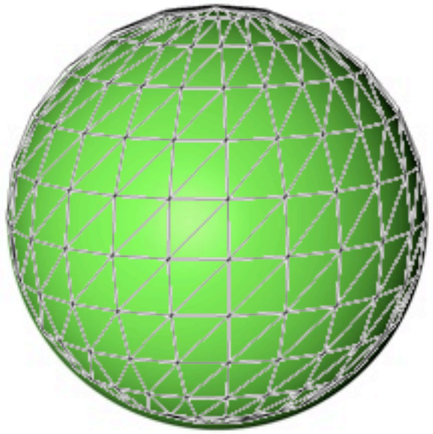

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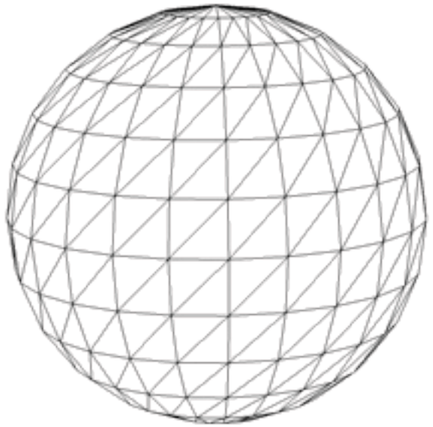

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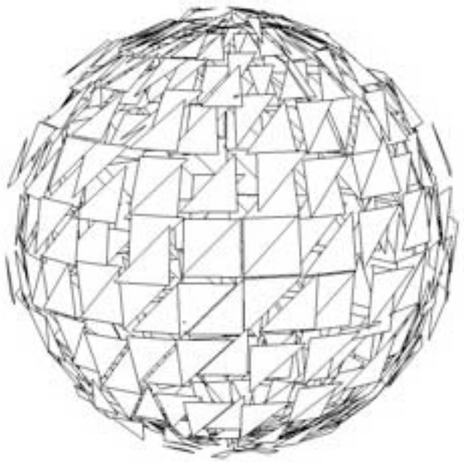

Der Slice-Algorithmus

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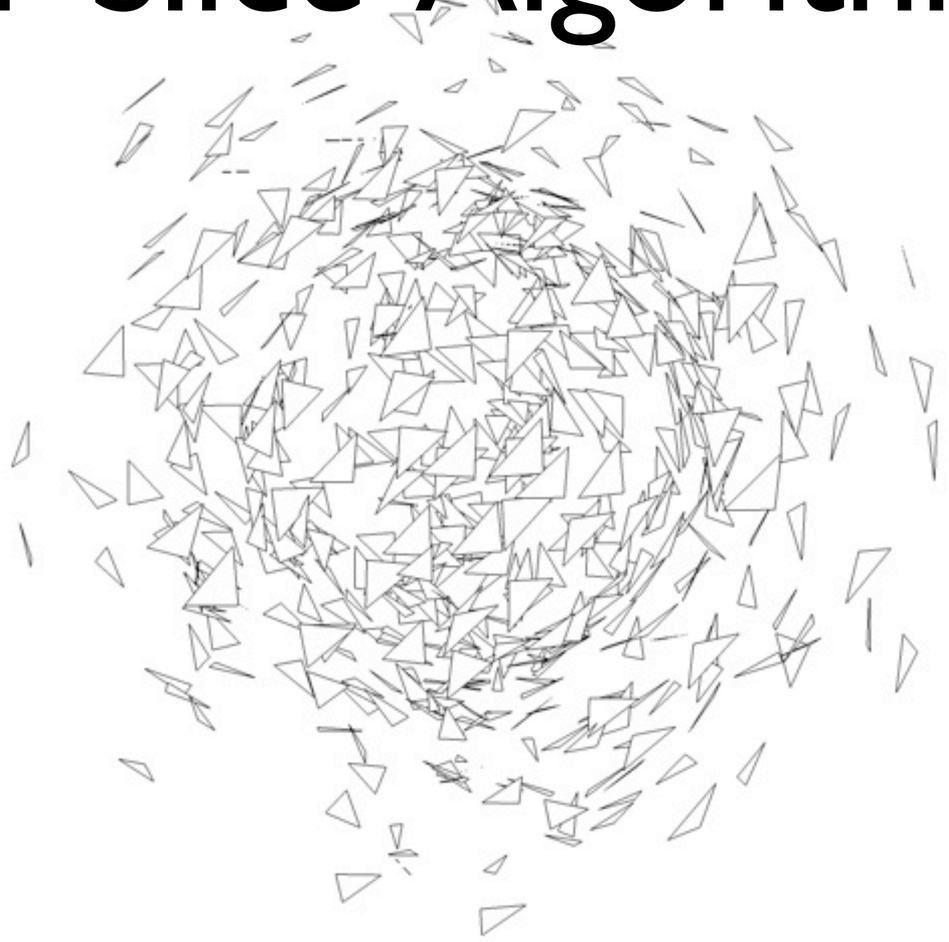

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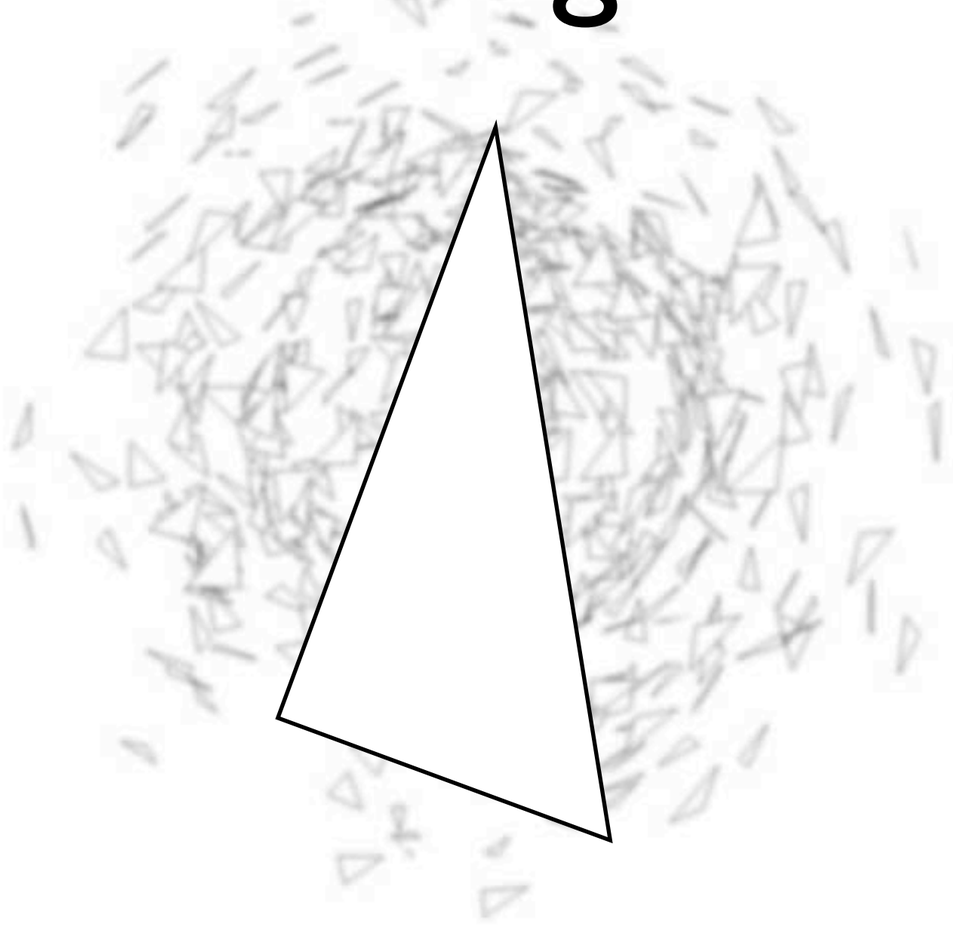

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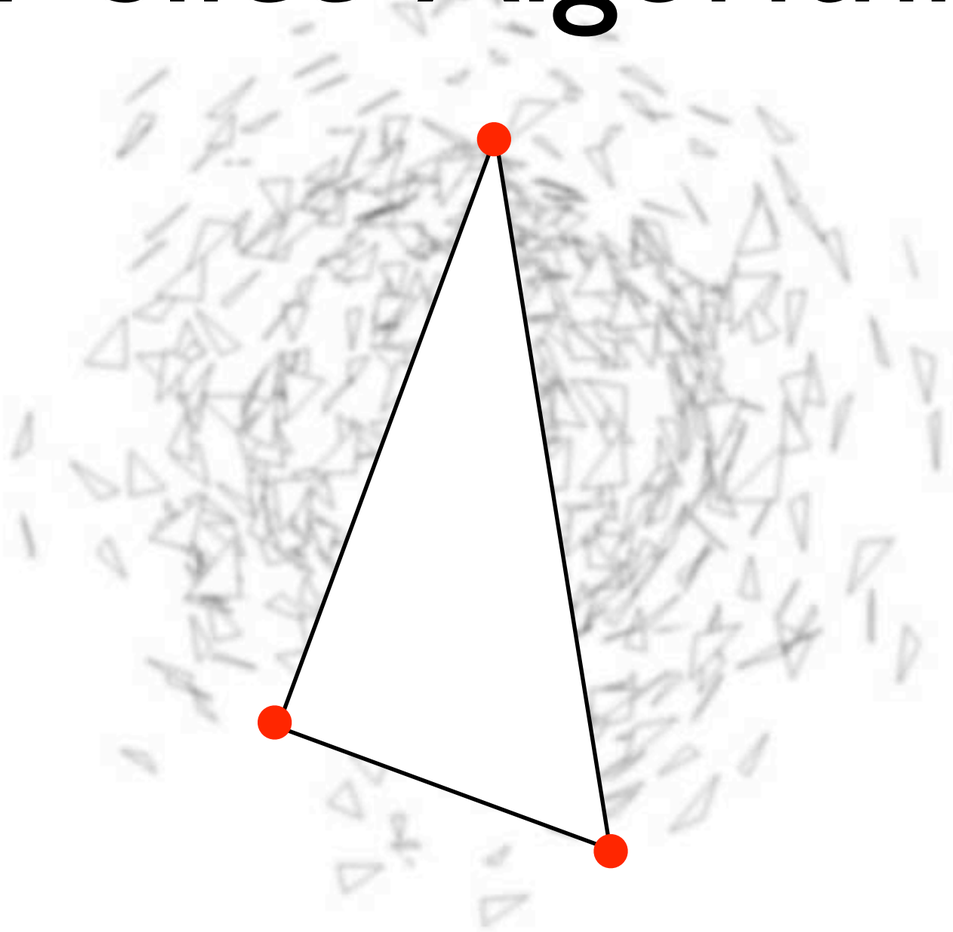

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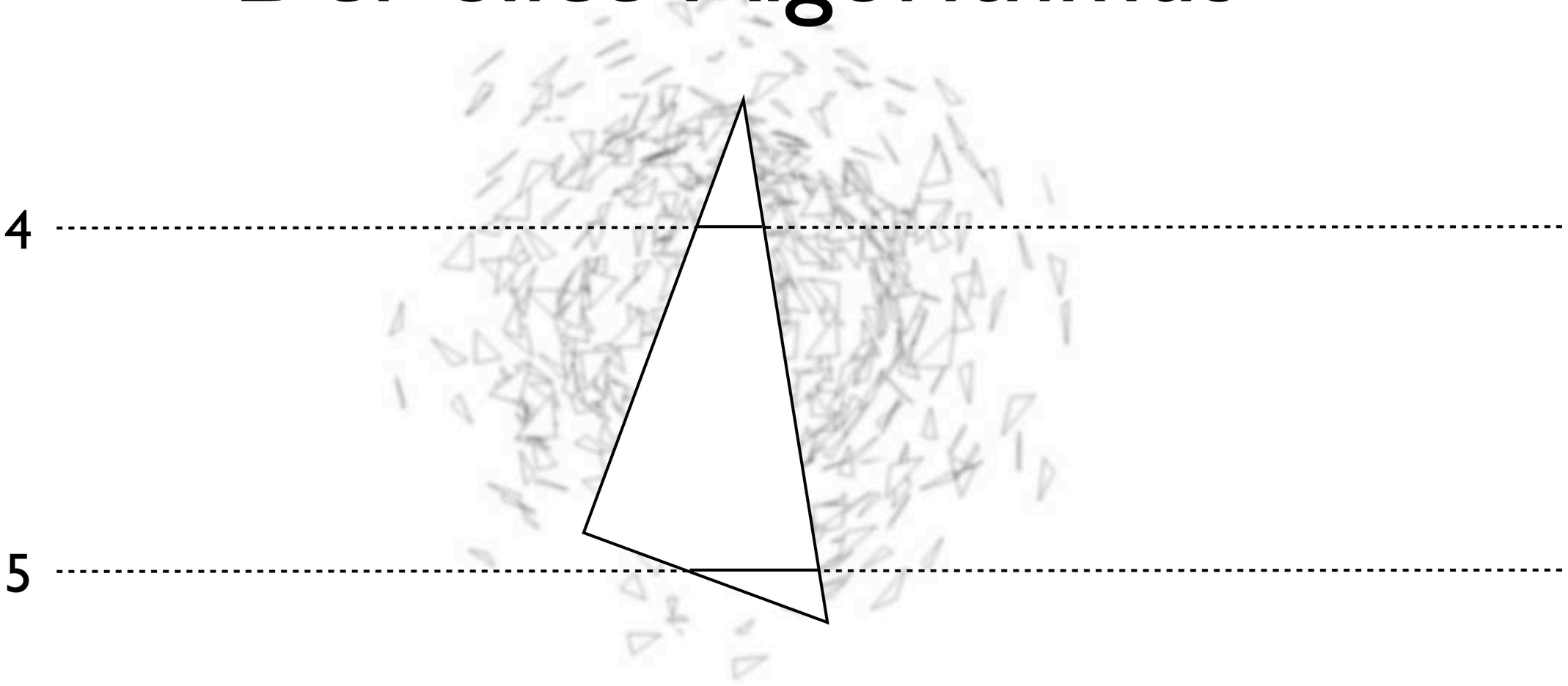

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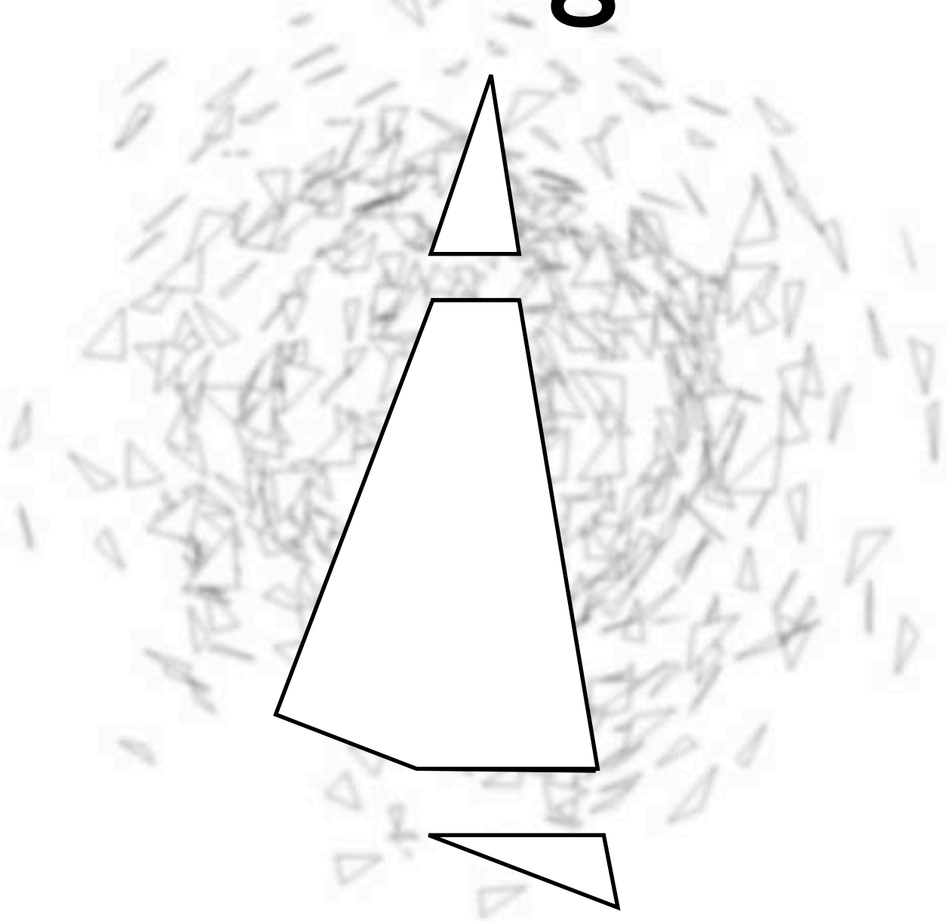

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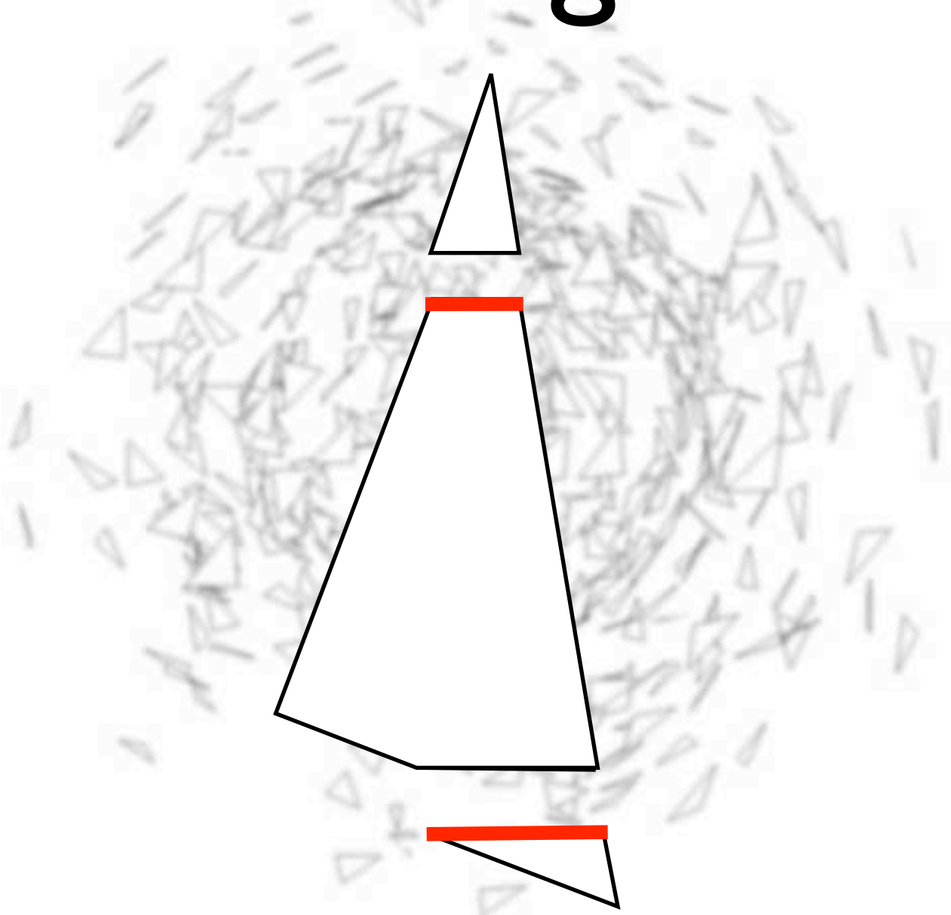

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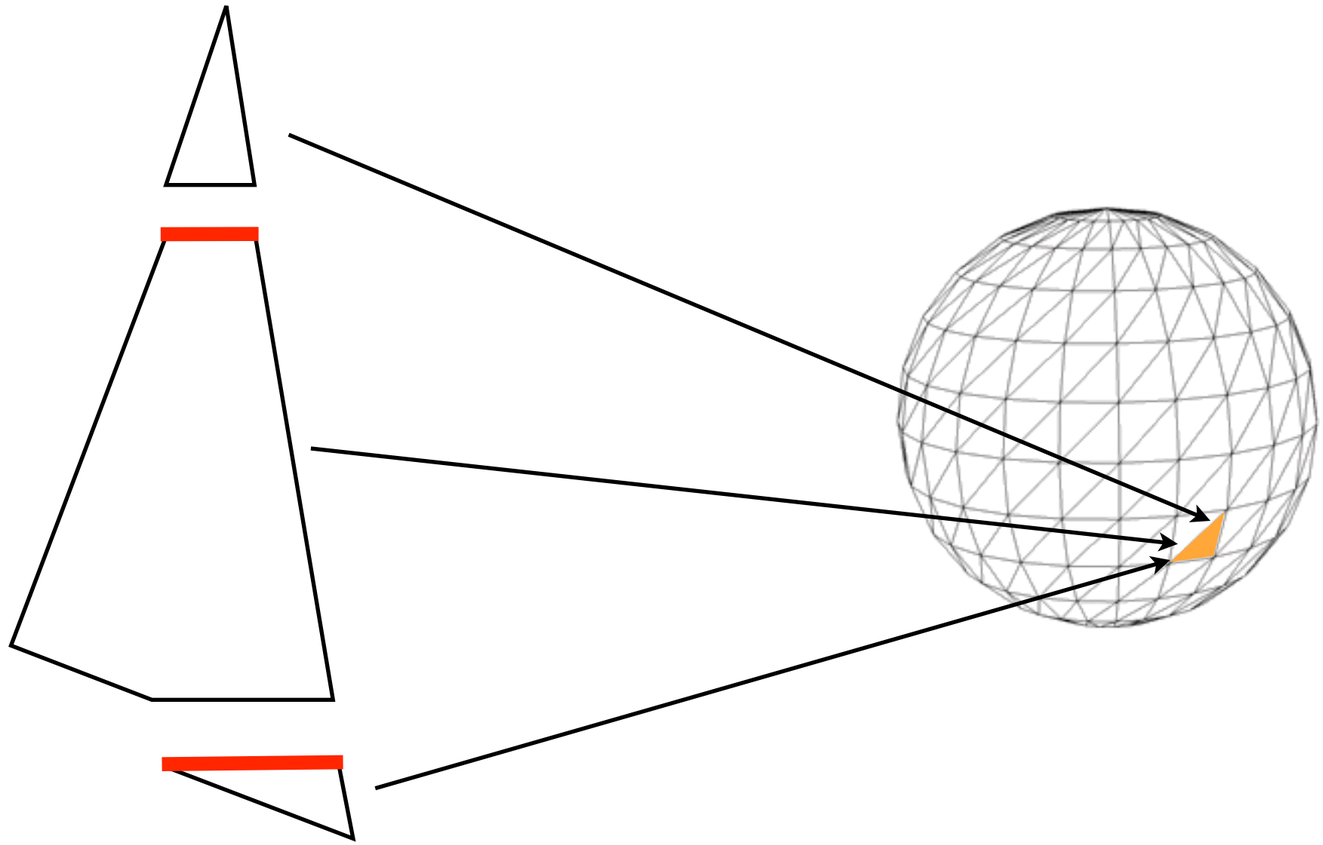

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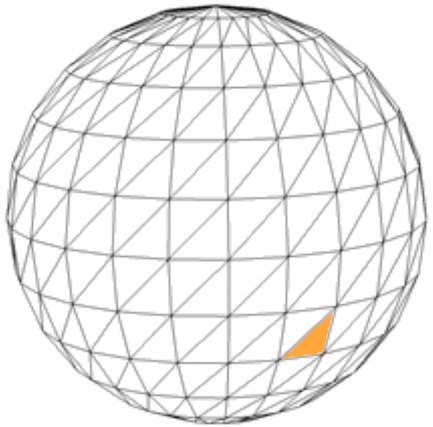

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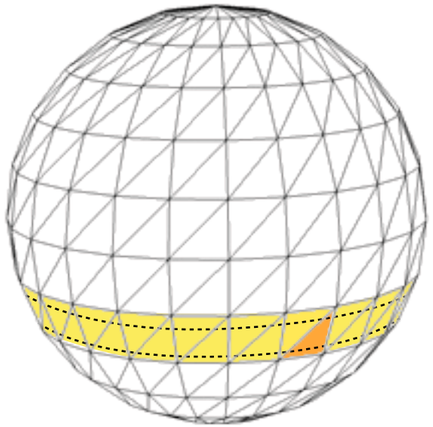

Der Slice-Algorithmus

- Index für Dreiecke anlegen
- *Für jedes Dreieck:*
  - Dreieck schneiden
  - Schnittkante(n) speichern
- *Für alle gespeicherten Schnittkanten:*
  - Umrisse zusammensetzen

Der Slice-Algorithmus

- Index für Dreiecke anlegen
- *Für jede Schnittebene:*
  - Alle betroffenen Dreiecke schneiden
  - **Umriss aus geschnittenen Kanten zusammensetzen**

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Demo

Pleasant3D

Kostenloser Download & Link zu Sourcen:

http://pleasantsoftware.com/developer/pleasant3d/

Macoun'10