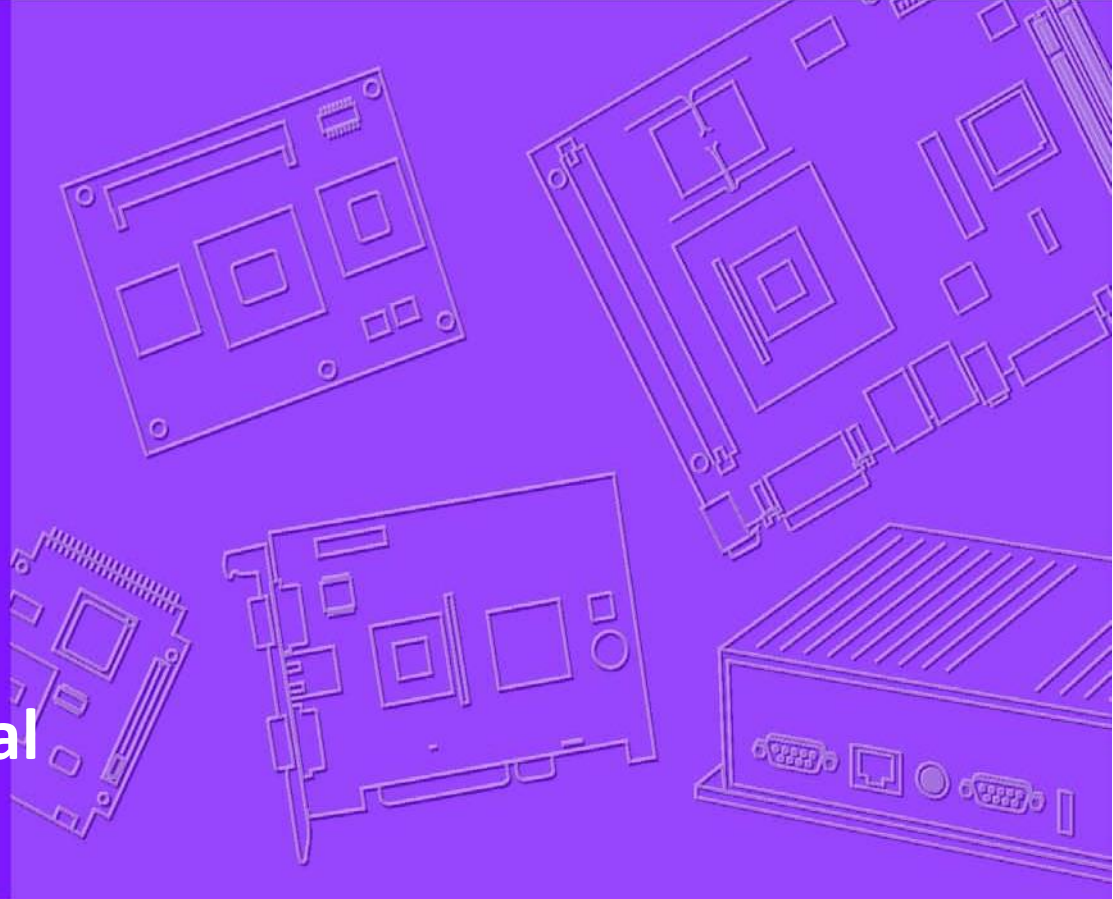


User Manual



SUSI AI

Secured & Unified Smart Interface Software for AI APIs

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1. Introduction

The SUSI AI APIs are used to get and set information of AI accelerated devices, such as NVIDIA x86 GPU card, NVIDIA ARM platform, and Intel x86 CPU / GPU; meanwhile, information of docker image and container could be retrieved as well.

Information SUSI API provides includes version, performance and the device status. Also, SUSI AI supports more than 1 device such as 2 GPU cards, several docker images or many containers run in the same environment.

2. Definition

2.1 SUSI AI Id

The SUSI AI Id for NVIDIA x86, NVIDIA ARM, Intel x86, docker image and container.

2.1.1 NVIDIA x86

```
#define SUSI_AI_ID_X86_NV_SN ..... 0x00026000
#define SUSI_AI_ID_X86_NV_VOLATILE_UTILITY ..... 0x00026001
#define SUSI_AI_ID_X86_NV_TEMP ..... 0x00026002
#define SUSI_AI_ID_X86_NV_PERF ..... 0x00026003
#define SUSI_AI_ID_X86_NV_POWER_USAGE ..... 0x00026004
#define SUSI_AI_ID_X86_NV_POWER_CAP ..... 0x00026005
#define SUSI_AI_ID_X86_NV_MEM_INUSE ..... 0x00026006
#define SUSI_AI_ID_X86_NV_MEM_TOTAL ..... 0x00026007
#define SUSI_AI_ID_X86_NV_FAN_SPEED ..... 0x00026008
#define SUSI_AI_ID_X86_NV_GET_COUNT ..... 0x00026009
#define SUSI_AI_ID_X86_NV_COMPUTE_MODE ..... 0x0002600A
#define SUSI_AI_ID_X86_NV_DISPLAY_ACTIVE ..... 0x0002600B

#define SUSI_AI_ID_X86_NV_NAME_STR ..... 0xA0000000
#define SUSI_AI_ID_X86_NV_DRIVER_VERSION_STR ..... 0xA0000001
```

2.1.2 NVIDIA ARM

```
#define SUSI_AI_ID_ARM_NV_CPU_USAGE ..... 0x00027000
#define SUSI_AI_ID_ARM_NV_GPU_USAGE ..... 0x00027001
#define SUSI_AI_ID_ARM_NV_TEMP ..... 0x00027002
#define SUSI_AI_ID_ARM_NV_RAM_USAGE ..... 0x00027003
#define SUSI_AI_ID_ARM_NV_FAN_SPEED ..... 0x00027004
#define SUSI_AI_ID_ARM_NV_POWER_MODE_TOTAL ..... 0x00027005

#define SUSI_AI_ID_ARM_NV_CUDA_VERSION_STR ..... 0xB0000000
#define SUSI_AI_ID_ARM_NV_CUDNN_VERSION_STR ..... 0xB0000001
#define SUSI_AI_ID_ARM_NV_TENSORRT_VERSION_STR ..... 0xB0000002
```

```

#define SUSI_AI_ID_ARM_NV_OPENCV_VERSION_STR.....0xB0000003
#define SUSI_AI_ID_ARM_NV_HW_VERSION_STR .....0xB0000004
#define SUSI_AI_ID_ARM_NV_PW_MODE_STR.....0xB0000005
#define SUSI_AI_ID_ARM_NV_JETPACK_INFO_STR .....0xB0000006
#define SUSI_AI_ID_ARM_NV_POWER_MODE_NAME .....0xB0000007

#define SUSI_AI_ID_ARM_NV_SET_FAN_SPEED .....0x0002D000
#define SUSI_AI_ID_ARM_NV_SET_POWER_MODE .....0x0002D001

```

2.1.3 Intel x86

```

#define SUSI_AI_ID_X86_INTEL_CPU_USAGE .....0x00030000
#define SUSI_AI_ID_X86_INTEL_GPU_USAGE.....0x00030001
#define SUSI_AI_ID_X86_INTEL_CPU_TEMP.....0x00030002
#define SUSI_AI_ID_X86_INTEL_GPU_TEMP.....0x00030003

#define SUSI_AI_ID_X86_INTEL_CPU_NAME_STR .....0xE0000000
#define SUSI_AI_ID_X86_INTEL_GPU_NAME_STR.....0xE0000001

```

2.1.4 Docker image

```

#define SUSI_AI_ID_DOCKER_IMG_SIZE .....0x00028000

#define SUSI_AI_ID_DOCKER_IMG_ID_STR.....0xC0000000
#define SUSI_AI_ID_DOCKER_IMG_TAG_STR.....0xC0000001
#define SUSI_AI_ID_DOCKER_IMG_OS_STR.....0xC0000002
#define SUSI_AI_ID_DOCKER_IMG_ARCHITECTURE_STR .....0xC0000003
#define SUSI_AI_ID_DOCKER_IMG_BUILD_TIME_STR.....0xC0000004
#define SUSI_AI_ID_DOCKER_IMG_BUILD_VER_STR.....0xC0000005

```

2.1.5 Container

```

#define SUSI_AI_ID_CONTAINER_CPU_USAGE .....0x00029000
#define SUSI_AI_ID_CONTAINER_MEM_USAGE .....0x00029001
#define SUSI_AI_ID_CONTAINER_MEM_INUSE.....0x00029002
#define SUSI_AI_ID_CONTAINER_MEM_TOTAL.....0x00029003

#define SUSI_AI_ID_CONTAINER_RUN_ON_IMG_ID_STR .....0xD0000000

```

```
#define SUSI_AI_ID_CONTAINER_RUN_ON_IMG_STR.....0xD0000001
#define SUSI_AI_ID_CONTAINER_NAME_STR .....0xD0000002
#define SUSI_AI_ID_CONTAINER_ID_STR.....0xD0000003
#define SUSI_AI_ID_CONTAINER_STATUS_STR.....0xD0000004
#define SUSI_AI_ID_CONTAINER_CONN_IP_STR .....0xD0000005
#define SUSI_AI_ID_CONTAINER_CONN_GATEWAY_STR.....0xD0000006
#define SUSI_AI_ID_CONTAINER_CONN_MAC_STR.....0xD0000007
```

2.2 Status/Error code

These error codes are the same as SUSI API definition.

```
#define SUSI_STATUS_NOT_INITIALIZED ..... 0xFFFFFFFF
#define SUSI_STATUS_INVALID_PARAMETER ..... 0xFFFFFEFF
#define SUSI_STATUS_UNSUPPORTED ..... 0xFFFFFCFF
#define SUSI_STATUS_READ_ERROR ..... 0xFFFFFAFF
#define SUSI_STATUS_WRITE_ERROR..... 0xFFFFFAFE
#define SUSI_STATUS_ERROR ..... 0xFFFFFOFF
#define SUSI_STATUS_SUCCESS ..... 0
```

2.3 SUSI AI support category and environment

The SUSI AI API supports NVIDIA ARM / x86 and Intel x86 hardware devices. The docker image and container are supported in Ubuntu 20.04 OS. The supporting category is as below:

- Windows 10 support
 - NVIDIA x86
Need to install NVIDIA Windows driver and make sure the command “nvidia-smi” workable in your computer.
 - Intel x86
Need to install Intel chipset driver according to your Intel x86 platform.

- Ubuntu 20.04 support
 - NVIDIA x86 / ARM
Need to install NVIDIA driver.

For example,

```
root# apt install nvidia-driver-515 nvidia-dkms-515
```

And install nvidia-smi package,

For example,

```
root# apt install nvidia-384
```

- Intel x86
- Docker image
Need pull docker image in your system. You can use this command for testing.

```
root# docker pull ubuntu
```
- Container
Need execute container. You can use this command for testing.

```
root# docker run -it --rm --privileged ubuntu
```


3. SDK Programming API

3.1 SusiAIInitialize

- **Syntax:**

```
SusiStatus_t SUSI_API SusiAIInitialize (void);
```

- **Description:**

In order to initialize process and get project board name.

- **Parameters**

None.

3.2 SusiAIGetCaps

- **Syntax:**

```
SusiStatus_t SUSI_API SusiAIGetCaps(uint32_t Id, uint32_t *pValue);
```

- **Description:**

Gets AI function control capabilities.

- **Parameters**

Id[in]

Selects support Id. See **Table 1**.

*pValue[out]

Pointer to a buffer that receives the target capability. See **Table 2**.

Return Status Code:

Condition	Return Value
Library uninitialized	SUSI_STATUS_NOT_INITIALIZED
pValue==NULL	SUSI_STATUS_INVALID_PARAMETER
Unknown Id	SUSI_STATUS_UNSUPPORTED
Success	SUSI_STATUS_SUCCESS

Table 1 AI Function Id

Id	Description
SUSI_ID_AI_SUPPORT_FLAGS	Support flags (Returns result see Table 2)

Table 2 AI Function Support Flags

Flag Name	Description
SUSI_AI_FLAG_SUPPORT_X86_NV	Support x86 NVIDIA
SUSI_AI_FLAG_SUPPORT_ARM_NV	Support ARM NVIDIA
SUSI_AI_FLAG_SUPPORT_DOCKER_IMG	Support docker image
SUSI_AI_FLAG_SUPPORT_CONTAINER	Support container
SUSI_AI_FLAG_SUPPORT_X86_INTEL	Support Intel CPU/GPU

3.3 SusiAIGetValue

- **Syntax:**

```
SusiStatus_t SUSI_API SusiAIGetValue(uint32_t Id, uint32_t *pValue);
```

- **Description:**

Gets the NVIDIA x86, NVIDIA ARM, Intel x86 and docker image, container information in value format.

- **Parameters**

Id[in]

Selects target value. See **Table 3, Table 6, Table 7, Table 8** and **Table 9**.

If the number of the target device, docker image or container is over than 1, then use the mask to add index in SUSI Id.

For example, if we have 2 NVIDIA GPU cards, the index is index 0 and 1.

To get index 0 use the Id (SUSI_AI_ID_X86_NV_SN | 0x00000000).

To get index 1 use the id (SUSI_AI_ID_X86_NV_SN | 0x00100000).

*pValue[out]

Pointer to a buffer that receives the target value.

Return Status Code:

Condition	Return Value
Library uninitialized	SUSI_STATUS_NOT_INITIALIZED
pValue==NULL	SUSI_STATUS_INVALID_PARAMETER

Unknown Id	SUSI_STATUS_UNSUPPORTED
Success	SUSI_STATUS_SUCCESS

Table 3 NVIDIA x86 Id

Id	Description	Unit
SUSI_AI_ID_X86_NV_SN	GPU index value. Starting with GPU index 0	
SUSI_AI_ID_X86_NV_VOLATILE_UTILITY	The GPU usage	%
SUSI_AI_ID_X86_NV_TEMP	Core GPU temperature	Celsius
SUSI_AI_ID_X86_NV_PERF	Current GPU performance state (See Table 4)	
SUSI_AI_ID_X86_NV_POWER_USAGE	Power being consumed by GPU at this moment	Watts
SUSI_AI_ID_X86_NV_POWER_CAP	Maximum power limit for GPU	Watts
SUSI_AI_ID_X86_NV_MEM_INUSE	Used size of memory	MiB
SUSI_AI_ID_X86_NV_MEM_TOTAL	Total size of memory	MiB
SUSI_AI_ID_X86_NV_FAN_SPEED	Current fan speed	%
SUSI_AI_ID_X86_NV_GET_COUNT	The number of NVIDIA GPUs	
SUSI_AI_ID_X86_NV_COMPUTE_MODE	Flags of whether individual or multiple compute applications may run on the GPU (See Table 5)	
SUSI_AI_ID_X86_NV_DISPLAY_ACTIVE	A display is initialized on this GPU	

Table 4 NVIDIA x86 Pstate

Pstate	Description
P0/P1	Maximum 3D performance
P2/P3	Balanced 3D performance-power
P8	Basic HD video playback
P10	DVD playback
P12	Minimum idle power consumption

Table 5 Compute Mode

Compute Mode	Description
0	Default. Multiple contexts are allowed per device

1	Exclusive Thread. Only one context is allowed per device, usable from multiple threads at a time
2	Prohibited. No contexts are allowed per device (no compute apps).
3	Exclusive process. It was added in CUDA 4.0. Prior CUDA releases supported only one exclusive mode, which is equivalent to "EXCLUSIVE_THREAD" in CUDA 4.0 and beyond.

Table 6 Container Id

Id	Description
SUSI_AI_ID_CONTAINER_COUNT	The number of containers be executed
SUSI_AI_ID_CONTAINER_RUN_COUNT	The number of containers at running status
SUSI_AI_ID_CONTAINER_PAUSE_COUNT	The number of containers at pause status
SUSI_AI_ID_CONTAINER_CPU_USAGE	The percentage of the host's CPU is using
SUSI_AI_ID_CONTAINER_MEM_USAGE	The percentage of the host's memory is using
SUSI_AI_ID_CONTAINER_MEM_INUSE	The container use memory size
SUSI_AI_ID_CONTAINER_MEM_TOTAL	The total memory size can use

Table 7 Docker Image Id

Id	Description
SUSI_AI_ID_DOCKER_IMG_COUNT	The number of docker images store in the system
SUSI_AI_ID_DOCKER_IMG_SIZE	The docker image size

Table 8 Intel x86 Id

Id	Description
SUSI_AI_ID_X86_INTEL_CPU_USAGE	The percentage of CPU using
SUSI_AI_ID_X86_INTEL_GPU_USAGE	The percentage of GPU using
SUSI_AI_ID_X86_INTEL_CPU_TEMP	The CPU temperature in degree C

Table 9 NVIDIA ARM Id

Id	Description
SUSI_AI_ID_ARM_NV_CPU_USAGE	The percentage of CPU using

SUSI_AI_ID_ARM_NV_GPU_USAGE	The percentage of GPU using
SUSI_AI_ID_ARM_NV_TEMP	The core GPU temperature
SUSI_AI_ID_ARM_NV_RAM_USAGE	RAM usage
SUSI_AI_ID_ARM_NV_FAN_SPEED	Fan speed
SUSI_AI_ID_ARM_NV_POWER_MODE_TOTAL	The number of power mode type. A NVIDIA example of power mode support 10W, 15W, 30W profiles. Use this API with this Id, the result of *pValue is 3. It also means 10W is index 0, 15W is index 1 and 30W is index 2.

3.4 SusiAISetValue

- **Syntax:**

```
SusiStatus_t SUSI_API SusiAISetValue(uint32_t Id, uint32_t Value);
```

- **Description:**

Sets AI function control in value format.

- **Parameters**

Id[in]

Selects target value. See **Table 10**

Value[in]

A value that sets the target value according to the Id.

Return Status Code:

Condition	Return Value
Library uninitialized	SUSI_STATUS_NOT_INITIALIZED
Wrong value	SUSI_STATUS_INVALID_PARAMETER
Unknown Id	SUSI_STATUS_UNSUPPORTED
Success	SUSI_STATUS_SUCCESS

Table 10 Set NVIDIA ARM Id

Id	Description
SUSI_AI_ID_ARM_NV_SET_FAN_SPEED	Set the fan speed from 0 to 255
SUSI_AI_ID_ARM_NV_SET_POWER_MODE	Set the power mode form index 0 to N in Value

parameter.

The setting value is reference by the **Table 9** Id of
SUSI_AI_ID_ARM_NV_POWER_MODE_TOTAL

3.5 SusiAIGetStringA

- **Syntax:**

```
SusiStatus_t SUSI_API SusiAIGetStringA (uint32_t Id, char *pBuffer, uint32_t *pBufLen);
```

- **Description:**

Gets the NVIDIA x86, NVIDIA ARM, Intel x86 and docker image, container text information about the AI Function.

- **Parameters**

Id[in]

Selects target value. See **Table 11, Table 12, Table 13, Table 14** and **Table 15**

*pBuffer[out]

Pointer to a buffer that receives the string of *pBuffer variable.

*pBufLen[in]

Pointer to a variable that specifies the size, in bytes, of the buffer pointed to by the *pBuffer parameter. When the function returns, this variable contains the size of the data copied to *pBuffer including the terminating null character.

Return Status Code:

Condition	Return Value
Library uninitialized	SUSI_STATUS_NOT_INITIALIZED
pBuffer==NULL pBufLen==NULL	SUSI_STATUS_INVALID_PARAMETER
Unknown Id	SUSI_STATUS_UNSUPPORTED
Success	SUSI_STATUS_SUCCESS

Table 11 NVIDIA x86 string Id

Id	Description
SUSI_AI_ID_X86_NV_NAME_STR	Board name

SUSI_AI_ID_X86_NV_DRIVER_VERSION_STR	Driver version
--------------------------------------	----------------

Table 12 Container string Id

Id	Description
SUSI_AI_ID_CONTAINER_RUN_ON_IMG_ID_STR	Image id string where this container runs on
SUSI_AI_ID_CONTAINER_RUN_ON_IMG_STR	Image name string where this container runs on
SUSI_AI_ID_CONTAINER_NAME_STR	Container name string
SUSI_AI_ID_CONTAINER_ID_STR	Container id string
SUSI_AI_ID_CONTAINER_STATUS_STR	Container current status including running, stop, pause
SUSI_AI_ID_CONTAINER_CONN_IP_STR	Container connection IP
SUSI_AI_ID_CONTAINER_CONN_GATEWAY_STR	Container connection gateway IP
SUSI_AI_ID_CONTAINER_CONN_MAC_STR	Connection mac address

Table 13 Docker image string Id

Id	Description
SUSI_AI_ID_DOCKER_IMG_ID_STR	Docker image Id
SUSI_AI_ID_DOCKER_IMG_TAG_STR	Docker image tag
SUSI_AI_ID_DOCKER_IMG_OS_STR	The built OS of the docker image
SUSI_AI_ID_DOCKER_IMG_ARCHITECTURE_STR	The built type of docker image such as AMD 64-bit, Arm 64-bit, and Armv7
SUSI_AI_ID_DOCKER_IMG_BUILD_TIME_STR	The build time of docker image
SUSI_AI_ID_DOCKER_IMG_BUILD_VER_STR	The build version of docker image

Table 14 Intel x86 string Id

Id	Description
SUSI_AI_ID_X86_INTEL_CPU_NAME_STR	Get CPU name
SUSI_AI_ID_X86_INTEL_GPU_NAME_STR	Get GPU name

Table 15 NVIDIA ARM string Id

Id	Description
SUSI_AI_ID_ARM_NV_CUDA_VERSION_STR	CUDA version
SUSI_AI_ID_ARM_NV_CUDNN_VERSION_STR	Cudnn version
SUSI_AI_ID_ARM_NV_TENSORRT_VERSION_STR	TensorRT version

SUSI_AI_ID_ARM_NV_OPENCV_VERSION_STR	OpenCV version
SUSI_AI_ID_ARM_NV_HW_VERSION_STR	Hardware version
SUSI_AI_ID_ARM_NV_PW_MODE_STR	Current power mode
SUSI_AI_ID_ARM_NV_JETPACK_INFO_STR	JetPack information
SUSI_AI_ID_ARM_NV_POWER_MODE_NAME	In order to know what the power mode name. Get the power mode naming from index 0 to N. Index 0 to N need to use mask add in this Id. The index mask is 0x0FF00000. The 0 to N index value referenced the result of Table 9 Id SUSI_AI_ID_ARM_NV_POWER_MODE_TOTAL