

# S-Cube™: Generic controller for active acoustics

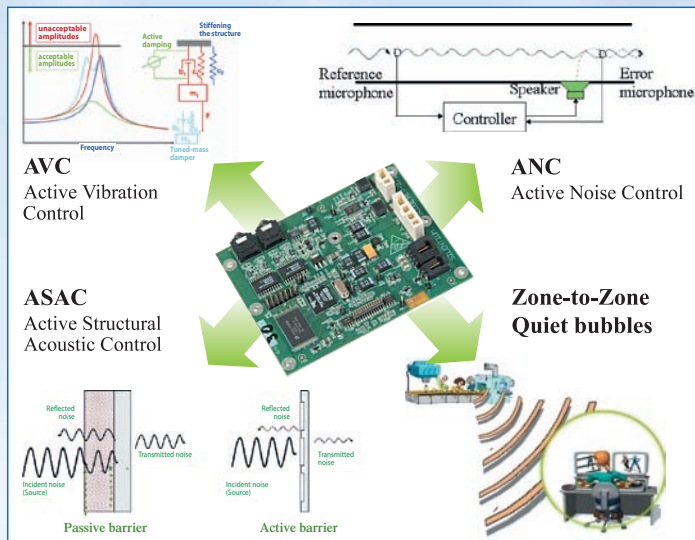
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## ABSTRACT

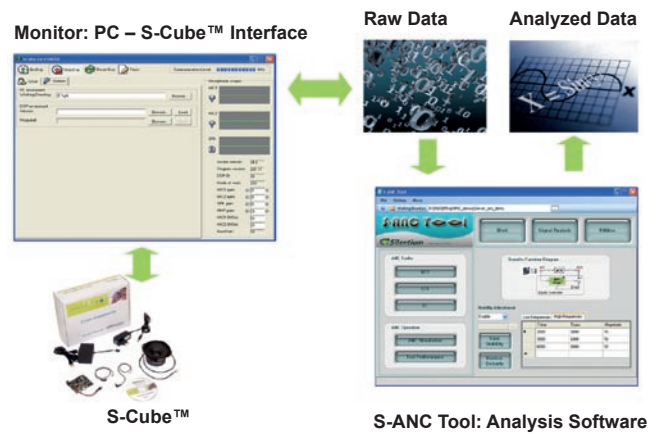
Silentium developed a **generic controller for active acoustics**, i.e. Active Noise control (ANC), Active Structural Acoustic Control (ASAC) and Active Vibration Control (AVC). Silentium offers a range of products for active acoustics' product developers and consultants in the field of active acoustics. These products are designed to assist them in developing active acoustics applications based on Silentium's S-Cube™ controller. Silentium proposes two alternatives for implementing the electronic controller: (i) S-Cube™ controller manufactured by Silentium, (ii) RDK (Reference Design Kit), which is a set of instructions for adding the core components of the S-Cube™ to the customer's electronic board.

## Acoustic development

The first stage is the inquiry and development. In this phase, the problem should be analyzed and a conceptual solution has to be designed. This is a preliminary and critical stage of the project. During this phase, noise mapping of the noise source is performed, whereas the engineer locates the most dominant noise sources of the system and evaluates the possible acoustic solutions with the S-Cube™ Development Kit (SCDK™).



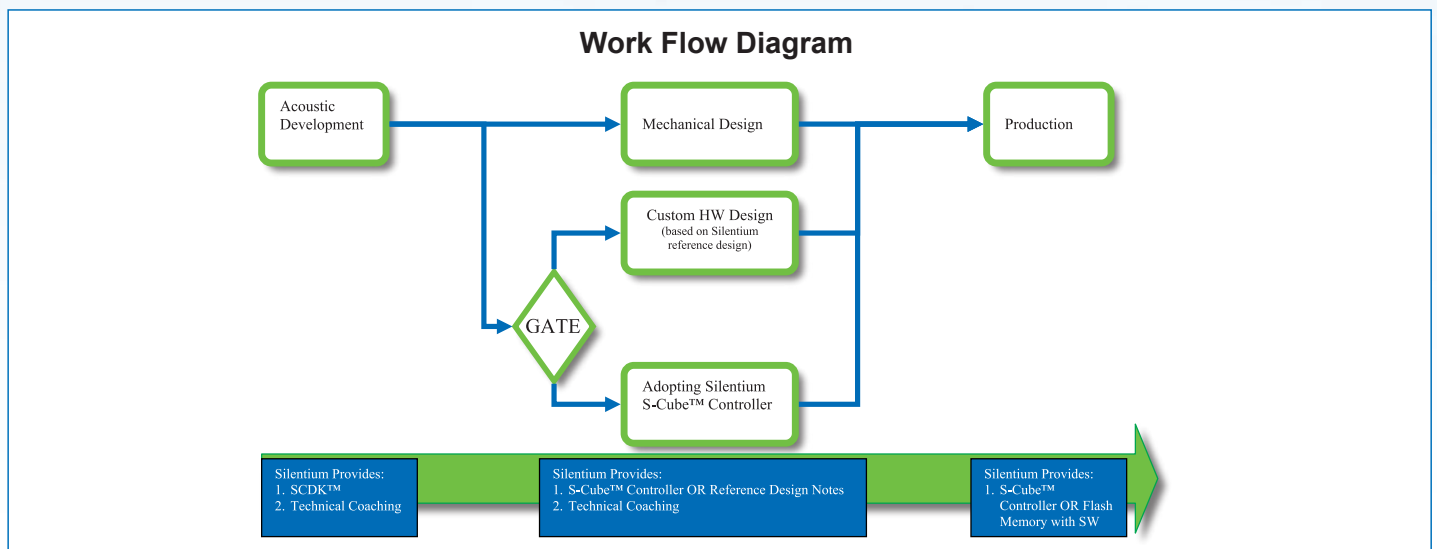
## S-Cube™ Development Environment



Silentium's SCDK™ provides system developers with a design and performance evaluation tool for noise and vibration reduction. It consists of an ANC/AVC controller board, signal analysis GUI, two microphones and a speaker. The controller is equipped with Silentium's unique algorithms and allows the developer to create broad band and spatial noise reduction. Most of the solutions achieve about 10dBA noise reduction on top of passive noise reduction obtained using acoustic materials only, and by that covering the entire audible range. Silentium supports this stage with technical guidance.

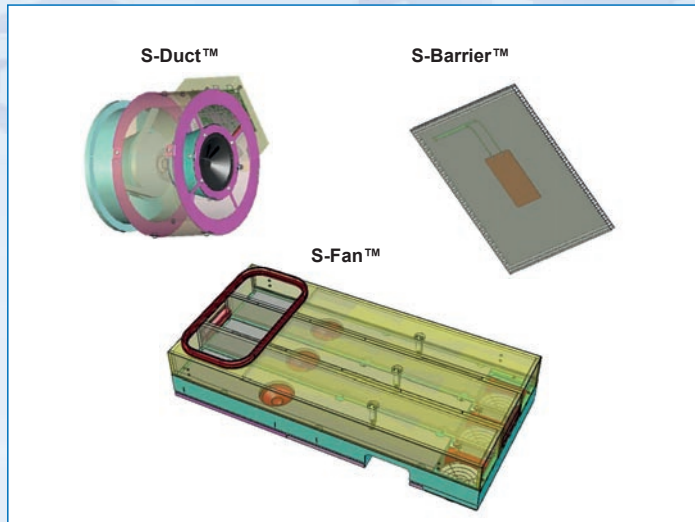
## SOLUTION - WORK FLOW

In order to implement a hybrid (active & passive) acoustic solution based on Silentium's technology, 3 major stages should take place, as described in the figure below.



## Mechanical Design

The next stage mostly involves mechanical work; meaning, mechanical design and production of the solution using the speaker and microphone for ANC applications or lightweight composite panels, equipped with piezoelectric actuators and sensors for AVC/ASAC applications.



## HW: S-Cube™ board or RDK

The HW design is an optional stage, it is feasible to lower the cost associated with Silentium's S-Cube™ electronic controller. Silentium also provides an alternative option to the S-Cube™ ANC controller, which is the Reference Design Kit (RDK), comprising: BOM, electronic design, and software for integrating the core components of the S-Cube™ controller on the customer's existing electronic board. At this stage, the customer will design and manufacture his own electronic board by adding the ANC electronic components as instructed in the RDK.



## Production

For the final stage, Silentium will provide Flash with SW in case custom-made HW is implemented during the development stage. The remaining HW components and ANC elements (e.g. speaker and microphone) will be supplied directly to the manufacturer of the solution provider. In case the solution was designed based on Silentium's S-Cube™ controller, it will be provided for this stage. In both scenarios, at the end of the assembly line, the controller calibrates itself automatically for each product and enables obtaining a low level of noise based product.

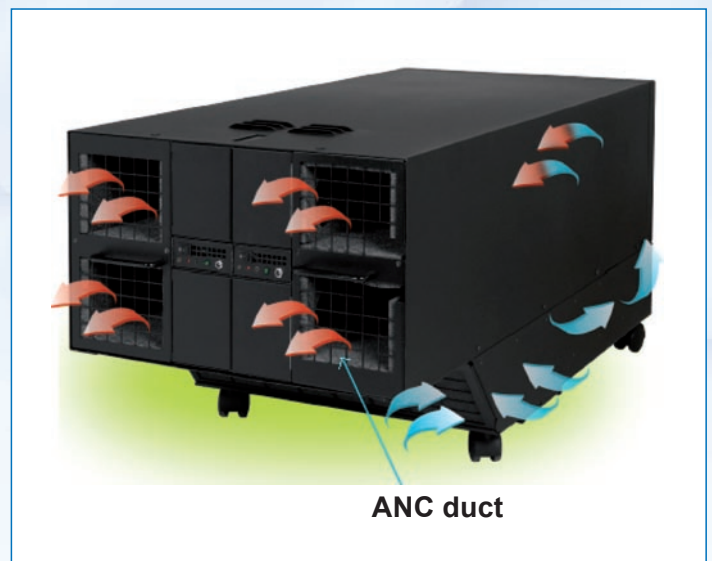
## Examples of ANC based products with Silentium's active acoustic solution

Cray uses a noise cancellation system to reduce fan noise.



Silentium, also supplies an active noise control system for Intel's compact blade chassis. The ActiveSilencer™ Enclosure (ASE™) for Intel® Modular Server.

Silentium has collaborated with Intel® to design the enclosure for reducing the server noise by up to 10dB(A) without causing any thermal degradation. Utilizing Silentium's ANC technology, the ASE™ can achieve unprecedented spatial noise reduction over the entire frequency bandwidth of the audible spectrum, while maintaining constant airflow to the unit to keep it cool.



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