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Title: SAMPLE - request permissions to capture static values on high speed advanced IO input and output pins

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What: This is to document the request to allow permissions for high speed advanced IO pins (both inputs and outputs) to capture fixed deterministic values during the SAMPLE instruction while operating in normal functional application (mission) mode.

Presently the IEEE 1149.6 Std allows for SAMPLE to capture a deterministic default value on high speed output driver pins (Permission 6.3.1.2 b). We would like this same permission to be extended to other types of pins.

Why: With the complexity and multiple configurability of SoC and their I/Os, the requirement for SAMPLE to always correctly operate in mission mode can be difficult to support. The demands of low-power designs which require advanced power saving operations in mission mode.

For example, specific input I/Os maybe powered down at the I/O analog circuitry before the driver to the BSR cell. Also, high speed I/Os may need to selectively power down the path to the BSR in mission modes in order to maintain signal integrity and to maintain timing accuracy. To power-up these circuits to enable a SAMPLE operation would actually disrupt and be invasive to normal mission mode. The power up sequence may be long. Some chips have "deep sleep" modes and would have to "awaken" and The complexity of verifying SAMPLE operations can be very time consuming.

Another example is for security aware SoCs. To make it more difficult to hack mission mode operations, an SoC may need to constrain SAMPLE BSR capture values.

How: This permission will allow 1149.1/1149.6 compliance and resolve the need for Errata and App notes related to the 1149.1 legacy SAMPLE capture operation many complex usages of I/Os.

This option to solving the above issues by allowing a capture of 0, 1, or X is deemed better than a true disruption of mission mode.