In the era of Internet of Things (IoT), billions of embedded devices need to be powered with battery. While the computation capability of IoT devices keeps advancing, the battery development is lagging. One promising solution to this power delivery problem is non-volatile processors (NVP), which harvest energy for themselves and employ emerging memory devices that are able to retain data over intermittent power supply. This allows them to perform computations when power is available, checkpoint and hibernate when power is scarce, and resume their work at a later time. However, the unique characteristics of non-volatile memories (NVM) and processors also bring new challenges in terms of write endurance, data integrity and confidentiality, as well as tool chain design. This talk highlights our works in defending NVP’s computation against new types of errors and attacks, increasing NVM lifetime and privacy, and tuning the design tools to fit NVM unique properties. These solutions together allow NVP-based energy harvesting devices to be deployed as edge computation units in either tough environments or for extended periods of time.

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