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Evolution of RAINSTORM

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The IAEA began using remote monitoring in 1997 as a means of optimizing inspection efforts while simultaneously improving the timeliness of safeguards information. Use of remote monitoring has gradually expanded over the last 15+ years. To manage the complexity of this vast network of diverse instruments, in 2012 the IAEA Department of Safeguards initiated an effort to define a set of requirements for Real-time And INtegrated STream-Oriented Remote Monitoring (RAINSTORM). In 2013, "Remote Monitoring Requirements for the Development of IAEA Safeguards Equipment" was published, which defines the data interface and data security requirements for all new remote-monitoring capable safeguards instruments.

The data interface requirements centre on the Hypertext Transfer Protocol (HTTP) [RFC 2616]. HTTP is an extremely simple, yet ubiquitous protocol (used many billions of times per day). HTTP also boasts a feature set that is well-suited to remote monitoring e.g. range retrieval and on-the-wire compression. Several sample software implementations are available with a BSD 3-Clause License.

The data security requirements centre on public-key infrastructure (PKI) and the public-key cryptography standards (PKCS). PKI provides far superior encryption/authentication security than pre-shared keys. The Agency has selected a Universal Instrument (cryptography) Token (UIT) that will provide greater private key protection and allow instruments to offload the CPU-intensive private-key operations. An ultralight platform-independent software driver and a sample software implementation are available with a BSD 3-Clause License.

Currently there are several instruments under development or in field testing that are "RAINSTORM compliant", including the Remote Monitoring Sealing Array (RMSA from Canberra/SNL), On-Line Enrichment Monitor (OLEM from ORNL/LANL), Laser Mapping for Containment Verification (LMCV from ISPRA) and Next Generation Adam Module (NGAM from Bot). The Next Generation Surveillance System (NGSS) is also RAINSTORM compatible.

Looking forward, we see increasing need for real-time data collection from safeguards instruments in the field. HTTP is well-suited for that task, particularly the HTTP version 2 protocol, which is currently in draft form.

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