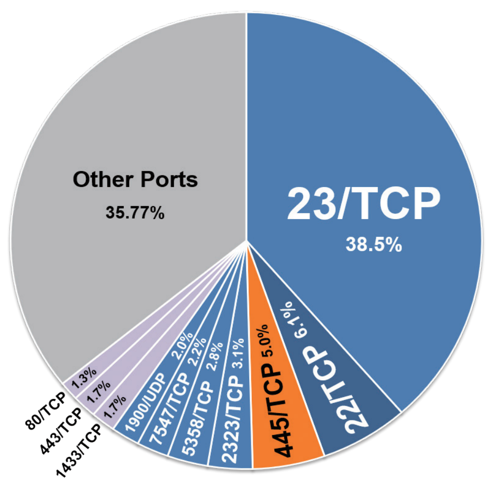
spond to attacks targeting vulnerabilities inherent to specific type of IoT devices such as mobile routers and home routers. These results reflect the increasing sophistication of attacks toward IoT devices.

Director Daisuke Inoue and Executive Technical Researcher Masaki Kubo of the Cybersecurity Laboratory have stated, "It is important that we raise our awareness of the need for applying security measures to IoT devices too, such as by accurately determining what IoT devices are used in the home or workplace and appropriately configuring and updating them as needed."

NICT is committed to enhancing the use of NICTER monitoring and analysis results and researching and developing security measures for IoT devices to improve security in Japan.

NICTER Analysis Report 2017 (detailed versions):
Web version: http://www.nict.go.jp/cyber/report.html
PDF version: https://www.nict.go.jp/cyber/report/NICTER_report_2017.pdf



Port	Target
23/TCP	IoT（WebCam）
22/TCP	IoT（Mobile Router） SSH
445/TCP	Windows（Server Service）
2323/TCP	IoT (WebCam, etc)
5358/TCP	IoT (WebCam, etc)
7547/TCP	IoT（WebCam, etc）
1900/UDP	IoT（Broadband router）
1433/TCP	Database server（SQL）
443/TCP	Web server（SSL/TLS）
80/TCP	Web server（HTTP）

Fig.1 : Percentage breakdown of packets by destination port number
Port number 22/TCP, which ranks second in number of packets, includes scan packets to ordinary authentication servers (Secure Shell (SSH) protocol) that are not mobile routers. "Other Ports" in the pie chart also include many packets targeting IoT devices.

Footnote

***1 NICTER (Network Incident analysis Center for Tactical Emergency Response)**
NICTER is an integrated system for rapidly grasping various types of threats to information security over a wide area and deriving effective countermeasures. It has functions for performing correlation analysis of information obtained by observing cyberattacks and collecting malware and for investigating the root causes of security threats.

***2 Cyberattack-related network packets**
This is the generic term for packets arriving at the darknet. These include scan packets from malware-infected devices searching for the next target to infect on the Internet and backscatter packets from servers under denial-of-service (DoS) attacks.

WATCH

Hybrid approach for more accurate "one-second"

Synergy between optical and microwave clocks, achieving a months-long time scale with high precision

National standard times are maintained to be synchronized with Coordinated Universal Time (UTC). Since the radiation frequency associated with the cesium hyperfine transition defines the length of "one-second," maintaining accurate Cs clocks is straightforward to keep time. Optical clocks, on the other hand, have been making rapid progress recently and now have much less systematic uncertainty than microwave standards. Nevertheless, nobody has so far generated the real-time signal of a time scale using optical clocks because it is still difficult to operate an optical clock continuously for one month or longer.

Researchers at the NICT Space-Time Standards Laboratory including atomic physicists and time-composing experts have demonstrated a novel time scale called the "optical-microwave hybrid time scale" that combines an optical lattice clock with a hydrogen maser (HM). The ^{87}Sr lattice clock, as a standard for pace adjustment, is sparsely operated for three hours once a week. This operation calibrates the frequency of the HM, and the measurements over the latest 25 days allow them to predict how the HM ticking rate will change. Then, they can adjust the HM frequency for the following week in advance to compensate for the predicted frequency drift.

"The method demonstrated here brings the benefit of optical frequency standards to time keeping."

The signal generated in this optical-microwave hybrid system continued for half a year without interruption. The resultant "one-second" was more accurate than that of UTC on that date, and the time deviated by 0.8 ns in half a year relative to TT(BIPM), which is the most accurate time scale post-processed by the International Bureau of Weights and Measures (BIPM). This demonstration shows it is possible to keep time with respect to the future optical definition of the second, which may come into play in the next decade.

Tetsuya Ido, director of NICT Space-Time Standards Laboratory, states "We serve the society by providing time endlessly without interruptions. The optical-microwave hybrid method demonstrated here brings the benefit of optical frequency standards to time keeping."

NICT, which generates Japan Standard Time (JST), aims to apply this hybrid method to the JST generation system step by step. The next step would be establishing a redundancy of optical frequency references. Another optical lattice clock or single-ion clock will work. They may utilize those in other laboratories by forming connections via optical fiber network or satellite-based frequency transfer.

Dr. Ido has also said "Highly precise optical clocks are expected to be geodetic sensors to detect the variation of gravitational environment. Such applications demand a reference that remains unchanged. Highly accurate and stable national time scale may play this role that is available in 24h/7d as an infrastructure."

Reference

Hidekazu Hachisu, Fumimaru Nakagawa, Yuko Hanado, and Tetsuya Ido, "Months-long real-time generation of a time scale based on an optical clock," Scientific Reports 8:4243 (2018).
DOI: 10.1038/s41598-018-22423-5
URL: http://www.nature.com/articles/s41598-018-22423-5

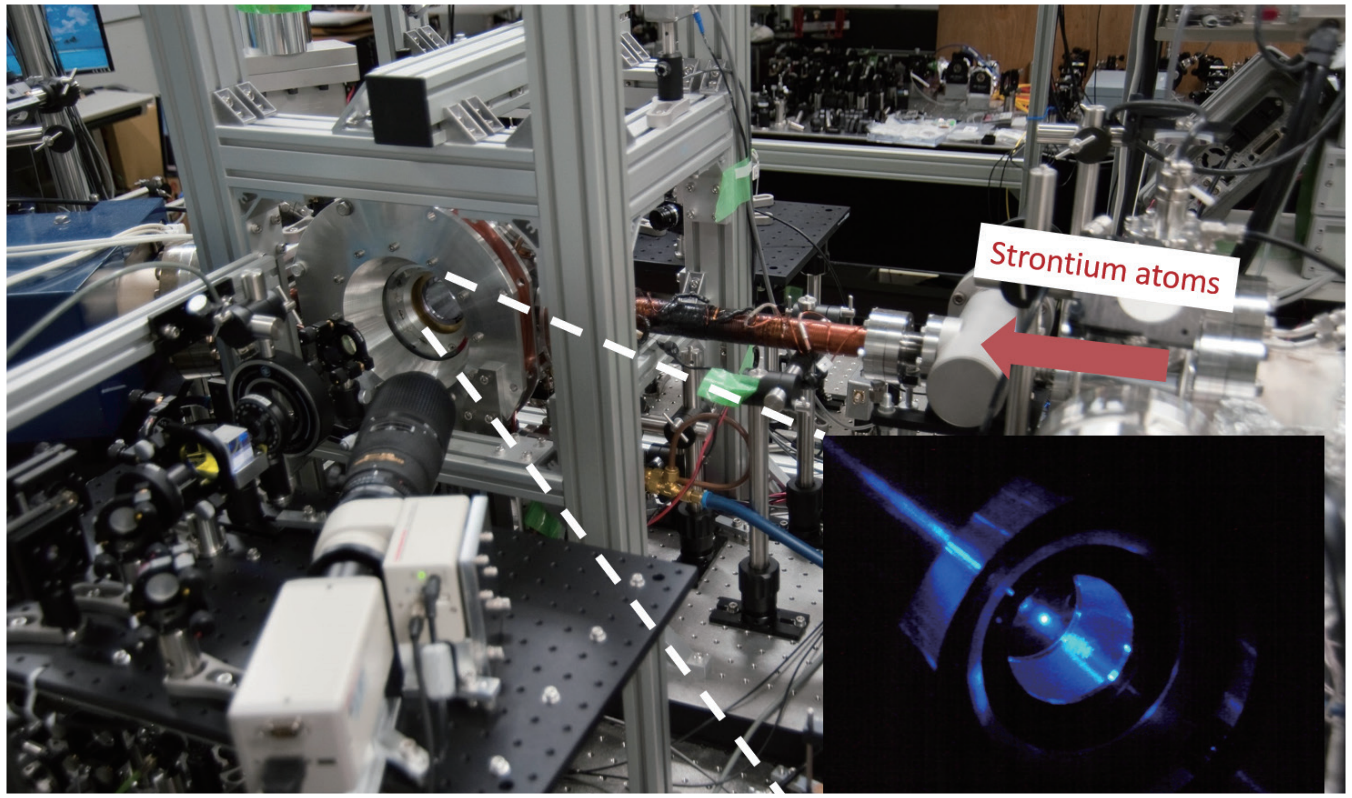


Fig.1 : ^{87}Sr optical lattice clock