The CATALINK Brief

A simple premise: complexity is the enemy of security. By embracing radical simplicity, a system can be created that is easy to use, difficult to hack, and reliable in the face of conflict – even potential nuclear use.

CATALINK | ˈkadə - liNGk |

noun
A novel communication technology seeking to be a modern hotline-style crisis communication system, to allow heads of states with nuclear weapons to communicate with each other, built to be secure from the silicon up.

Origins
From the English words cataclysm and link (CATAclysm + LINK)

"Brinkmanship is… the deliberate creation of a recognizable risk of war, a risk that one does not completely control."
-       Thomas Schelling

CATALINK was conceived during international meetings convened by the Institute for Security and Technology (IST) at Stanford University's Hoover Institute in 2019, where IST brought together global nuclear policymakers, academics, current and former senior decisionmakers, and experts from the technology sector for discussions on nuclear command, control, and communications (NC3). These discussions highlighted the technical vulnerability of communication systems - but also solutions that could reinforce resilience and trust. The combination of policymakers and technologists is critical to the CATALINK project, and that mix continues to advise and develop the conceptual system today.

"To facilitate constructive and stable relations and to reduce the likelihood of military conflict and escalation, mechanisms and tools are needed that increase time for decision making and dispute resolution that reduce the risk of crises. To this end, focus is required on crisis prevention mechanisms, including communication tools and protocols that can allow States to clarify the intent of other parties and enact preventive measures to avoid an incident or its escalation into a crisis. It is also important to have established procedures that drive diplomatic solutions to resolve a crisis, if one nevertheless erupts."

Working paper submitted by China, France, the Russian Federation, the United Kingdom of Great Britain and Northern Ireland and the United States of America to the 2022 NPT Review Conference

The Problem

The permanent members of the United Nations Security Council (P5) have made some headway on strategic and nuclear risk reduction. Yet the present high level of risk is compounded by shortcomings of current hotline technologies:

Lack of Trust and Cooperation. The contemporary security environment has not facilitated the development and implementation of secure hotlines as a security and diplomatic priority. A lack of confidence in the intentions of other states has decreased desire to cooperate and communicate, at a time when the opposite is required to mitigate the risks of nuclear war.

Historical Ineffectiveness. The current technologies, networks, and systems that hotlines rely on have not been sufficient to lessen threats of conflict escalation. The performance of existing systems is often unreliable, and not all nuclear states have access to the technology and technical expertise which could increase technological performance.

Insufficient Focus. Broad definitions of hotlines have undermined their implementation. Referring to unencrypted communications as "hotlines" ignores that in order to reduce nuclear risks a hotline needs to be a secure and unbreakable network.

Insufficient Breadth. The presence of nine nuclear armed states (not to mention their allies and adversaries that would undoubtedly be pulled into a potential nuclear crisis) complicates the logistics and technical requirements of designing, and has prevented the implementation of, a global nuclear communication system.

The Solution

There are several advantages of a single system over multiple, bilateral hotlines, primarily that it can be designed to address these aforementioned flaws. A modern, trustworthy, multilateral nuclear communications system would represent a significant improvement over existing arrangements. To be effective, such a system must be:

- Secure from espionage and exploitation via encryption;
- Trusted by states knowing the technology has been built without technical vulnerabilities; and
- Resilient in the case of environmental, nuclear, and conventional crises.

Achieving a hotline which can operate at a level and security approved by each of the nine nuclear-armed states has not yet been possible nor even attempted. Based on the understanding that shared confidence is central to nuclear risk reduction, CATALINK represents an achievable, operable, and sustainable solution.

"Despite the nearly one dozen hotline links that now exist, not all countries with nuclear weapons are linked up at the level of heads of state or, in some cases, at any level. Astonishingly, in an age when any nuclear crisis or conflict could not be contained with certainty to two states, there are currently no multilateral communication lines that can be trusted. After all, trust is the issue: trust in the identity of the interlocutor; trust in the system itself, including its robustness under the most extreme conditions; and trust in the message it carries."
- "Zoom Won't Stop A Nuclear War", Foreign Policy Magazine, Sahil Shah and Leah Walker

CATALINK Key Elements

Radical Simplicity
Security: The idea that complexity is the enemy of security, focused on the security and resilience of the firmware, software, and hardware. Achieved by the return to hand coding of software and moving away from the general-purpose operating system.

Open Source Design
Trust: CATALINK will consist of open source components and remain expressly transparent, so as to ensure integrity and trust. Ciphers are chosen by senders, without bias toward a specific country.

Formal Methods for NC3
Reliability: ensured by the use of theoretical mathematical proofs for the hardware and software, to show with confidence that CATALINK can do what it is designed to do.

International Collaborations and Outreach
Coalition Building: The CATALINK team has been working to build international support for the system and has been in contact with governments of, and civil society organizations in, several non-nuclear possessor states (NNPS) and nuclear possessor states (NPS).

CATALINK

The CATALINK communications system
A 21st century hotline system – internationally-driven, secure, resilient with the potential to avert catastrophes amidst rising tensions between adversaries.

The Puck
A simple, secure and robust device meant for dedicated communication between global leaders and officials during a nuclear crisis or other high-stakes events like disaster response. Designed with an open-source platform, will send text messages in minutes.

The Broker
An interface between the puck and the ROCCS, which determines the path of the Puck message throughout the desired network.

The ROCCS (Resilient Omni Frequency Crisis Communications System)
A permanently active global mesh network, uses multiple channels/wavelengths to ensure reliable message relays; one of a variety of redundant networks for puck messages to use depending on availability, the threat environment, and the type of message sent.

> *"Reducing the risk of miscalculation or misperception and accidental use of nuclear weapons [should be prioritized], including through the establishment and enhancement of hotlines building on robust and trusted crisis communication technology, joint data centers, military-to-military dialogue, and other cooperative measures."*
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> *From "A Nuclear Risk Reduction Package", the Working paper submitted by the Stockholm Initiative to the 2022 NPT Review Conference, supported by Albania, Argentina, Australia, Belgium, Bolivia, Canada, Denmark, Ethiopia, Finland, Germany, Greece, Iceland, Indonesia, Japan, Jordan, Kazakhstan, Luxembourg, the Netherlands, New Zealand, North Macedonia, Norway, Palau, Philippines, Republic of Korea, Republic of Moldova, Republic of North Macedonia, Uruguay, Slovenia, Spain, Sweden, and Switzerland.*

An internationally-driven, secure, resilient communications solution that has the potential to avert catastrophes amidst rising tensions between adversaries.

CATALINK will need to be supported by most, and ideally all, states with nuclear weapons. Once states express interest, the next step is a series of trust and confidence building measures to prepare states to use CATALINK and to familiarize themselves with their new communication ability, making CATALINK both a risk reduction technology and a catalyst for dialogue and collaboration.

Many major organizations proposing risk reduction measures have advocated for better communication technologies and a new hotline architecture, including the Stockholm Stepping Stones, Global Enterprise, and Nonproliferation and Disarmament Initiatives.

States without nuclear weapons and civil society groups are also critical in this process. They have roles to play in sponsoring and supporting CATALINK, technically and diplomatically, as well as advocating for the risk reduction it would foster. We hope that CATALINK will also encourage the development and adoption of other risk reduction technologies, building confidence between adversaries.

> *"We are ready to work with all relevant stakeholders towards the creation and enhancement of secure communication channels among the capitals of the nuclear-weapon states. This modest step, among others, can improve communication and transparency, including in a crisis."*
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> *Working paper submitted by France, the United Kingdom of Great Britain and Northern Ireland and the United States of America to the 2022 NPT Review Conference*

> *"Recognizing the importance of crisis avoidance and crisis management for reducing the risks of nuclear weapons, [nuclear weapons states should] affirm their commitment to ensure the existence of unambiguous pathways and mechanisms for communication should a crisis occur."*
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> *Global Enterprise to Strengthen Nonproliferation and Disarmament Joint Voluntary Commitments (JVCs), Nuclear Threat Initiative*

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