April 29, 2021

AWARENESS & ADOPTION

NTIA Software Component Transparency

Audra Hatch, Joshua Corman

OVERVIEW

- Recap: Mission and Goals
- What We’re Working On
  - Today’s Highlights
  - Ongoing Efforts
  - Future Initiatives
- Community Ask
- Resources

RECAP: AWARENESS & ADOPTION MISSION

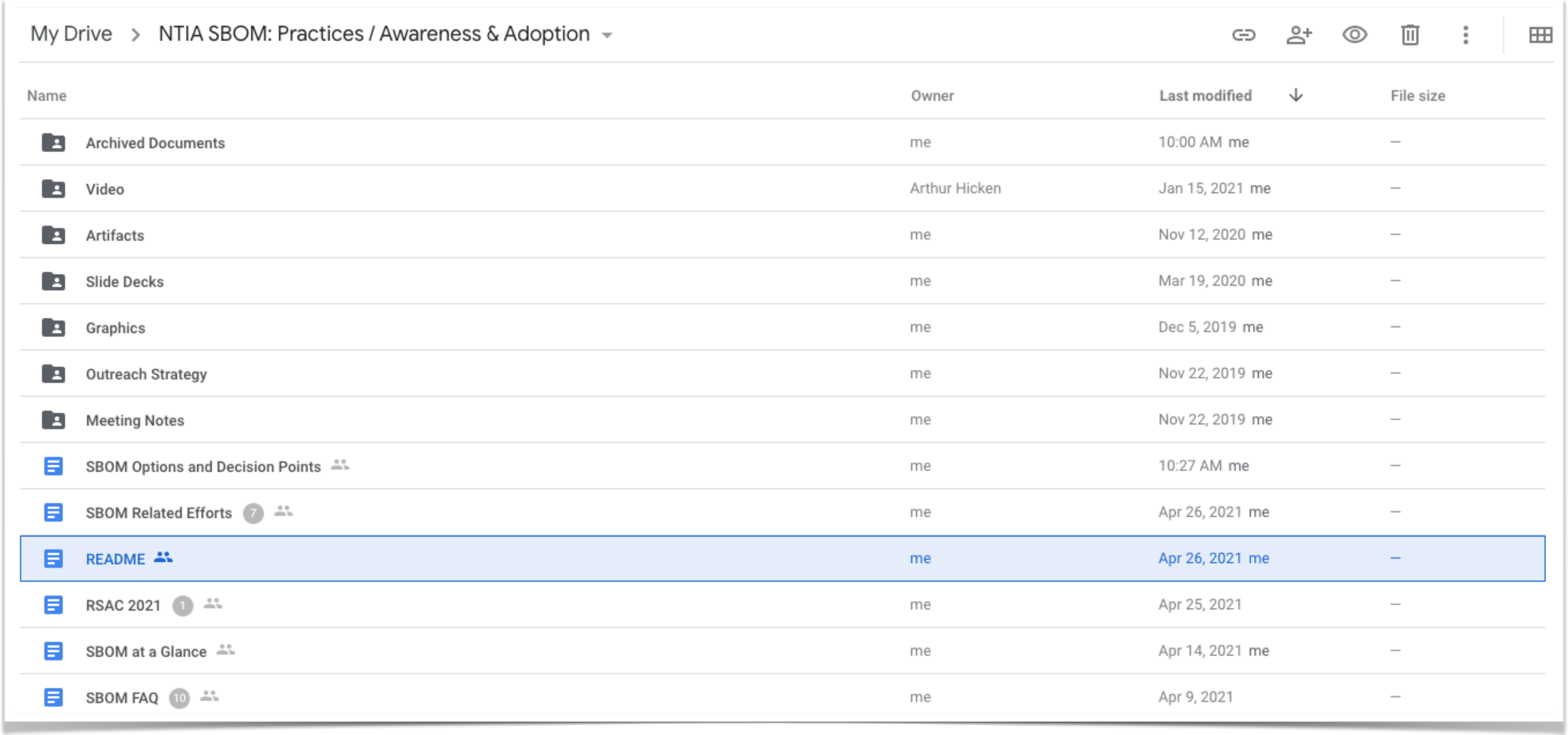
- Work will focus on promoting SBOM as an idea and a practice.
- Tasks identified include:
  - Building a broader outreach strategy with outreach targets
  - Shorter documents with specific outreach goals for sectors, organizational role, etc.
  - Coordinating with related efforts
  - More explicit business cases for SBOM adoption

RECAP: HIGH LEVEL APPROACH TO GOALS

- Outreach / Increase Awareness
  - Let people know about SBOM
    - Conference Presentations, Webinars, etc.
  - Connect People
    - Invitation to NTIA groups & documents, other networking, etc.
- Increase Adoption
  - Address early questions about SBOM
  - Provide fit-for-purpose “getting started” materials
  - Journeys: Crawl / Walk / Run

WHERE TO START: README

- README file containing links to documents and ongoing efforts in the NTIA SBOM Awareness & Adoption Working Group Google Drive:
  - https://bit.ly/sbom-awareness-readme



My Drive > NTIA SBOM: Practices / Awareness & Adoption

Name	Owner	Last modified	File size
Archived Documents	me	10:00 AM me	—
Video	Arthur Hicken	Jan 15, 2021 me	—
Artifacts	me	Nov 12, 2020 me	—
Slide Decks	me	Mar 19, 2020 me	—
Graphics	me	Dec 5, 2019 me	—
Outreach Strategy	me	Nov 22, 2019 me	—
Meeting Notes	me	Nov 22, 2019 me	—
SBOM Options and Decision Points	me	10:27 AM me	—
SBOM Related Efforts 7	me	Apr 26, 2021 me	—
README	me	Apr 26, 2021 me	—
RSAC 2021 1	me	Apr 25, 2021	—
SBOM at a Glance	me	Apr 14, 2021 me	—
SBOM FAQ 10	me	Apr 9, 2021	—

WHAT WE'RE WORKING ON

- **Today's Highlights:**
  - SBOM at a Glance
  - SBOM Options & Decision Points Graphic
  - Asking for SBOMs
  - Supplying SBOMs
  - SBOM Related Efforts
  - FAQ
  - Graphics Repository
  - Slide Repository

- **Ongoing Efforts:**
  - FAQ
  - Graphics & Slide Repositories
  - News, Recordings, & Presentations
  - SBOM Calendar
  - Business Two-Pagers
  - Virtual Engagement Opportunities
  - POC Conversations & Expansions
  - Knowledge Base
  - SBOM-Adjacent Topics
  - Questions For Your Suppliers

- **Future Initiatives:**
  - Use Case Repository
  - Journeys & Playbooks
  - SBOM Starter Slides
  - Additional Explainer Videos
  - Proof of Concept Virtual Summit
  - Ideas for 2021

DELIVERABLES AND STATUS

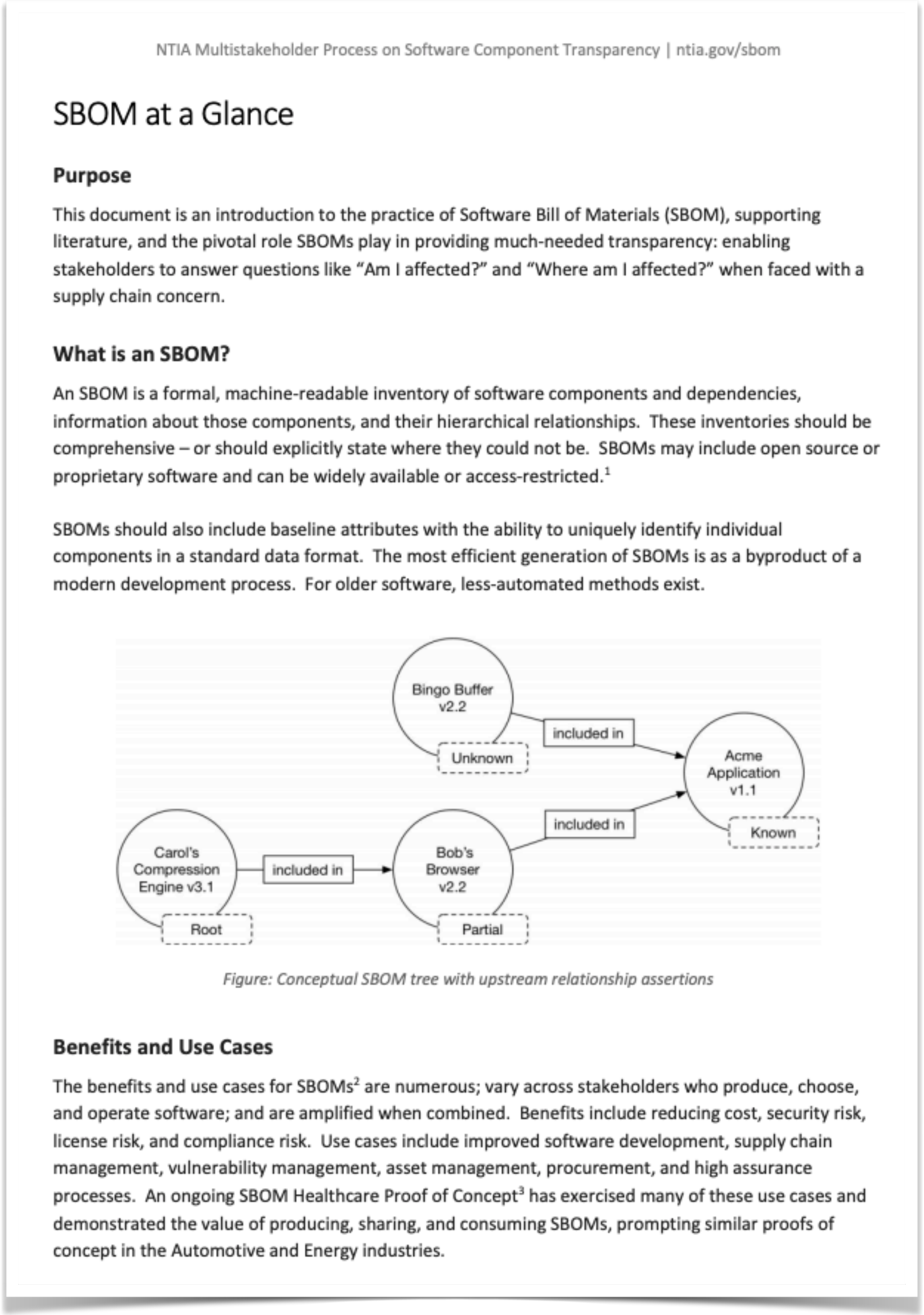
Deliverable	On Deck	Development	In Review	Released
FAQ		X	X	X
FAQ on GitHub				X
SBOM at a Glance				X
SBOM Options & Decision Points				X
NTIA SBOM Overview Two-Pager	v 2			X
Explainer Videos	X			X*
SBOM Calendar				X
SBOM Related Efforts			X	
SBOM News		X		*
Recordings & Presentations		X		*
Graphics & Slide Repositories		X		*
Community Survey on SBOM Process			X	*
SBOM Business Two-Pagers		X		
Virtual Engagement Opportunities		X		
Proof of Concept Conversations & Expansions		X		
Knowledge Base		X		
SBOM-Adjacent Topics Spreadsheet		X		
Questions for your Suppliers		X		
SBOM Starter Slides		X		
Asking for SBOMs	X			
Supplying SBOMs	X			
Journeys & Playbooks	X			
Proof of Concept Virtual Summit	X			

* Available and/or continuously updated in Google Drive

SBOM AT A GLANCE

- Intro to SBOMs, supporting literature, and the pivotal role of SBOMs for supply chain transparency
  - What is an SBOM?
  - Benefits & Use Cases
  - Baseline Component Information
  - Machine-Readable Formats & Tools
  - Sharing & Exchanging
  - Learn More

- Published on ntia.gov/sbom



NTIA Multistakeholder Process on Software Component Transparency | ntia.gov/sbom

SBOM at a Glance

Purpose

This document is an introduction to the practice of Software Bill of Materials (SBOM), supporting literature, and the pivotal role SBOMs play in providing much-needed transparency: enabling stakeholders to answer questions like "Am I affected?" and "Where am I affected?" when faced with a supply chain concern.

What is an SBOM?

An SBOM is a formal, machine-readable inventory of software components and dependencies, information about those components, and their hierarchical relationships. These inventories should be comprehensive – or should explicitly state where they could not be. SBOMs may include open source or proprietary software and can be widely available or access-restricted.[1]

SBOMs should also include baseline attributes with the ability to uniquely identify individual components in a standard data format. The most efficient generation of SBOMs is as a byproduct of a modern development process. For older software, less-automated methods exist.

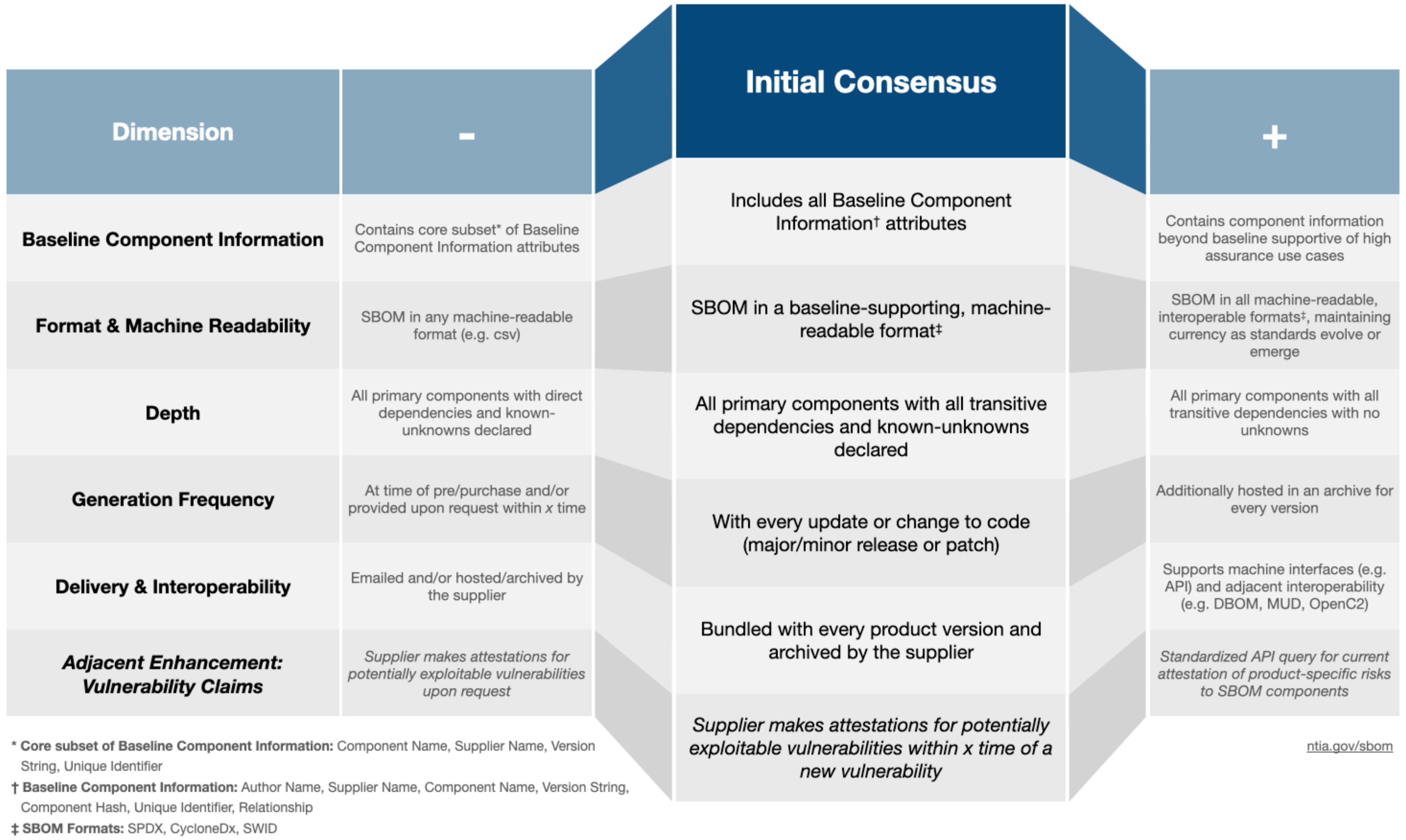
Figure: Conceptual SBOM tree with upstream relationship assertions

Benefits and Use Cases

The benefits and use cases for SBOMs[2] are numerous; vary across stakeholders who produce, choose, and operate software; and are amplified when combined. Benefits include reducing cost, security risk, license risk, and compliance risk. Use cases include improved software development, supply chain management, vulnerability management, asset management, procurement, and high assurance processes. An ongoing SBOM Healthcare Proof of Concept[3] has exercised many of these use cases and demonstrated the value of producing, sharing, and consuming SBOMs, prompting similar proofs of concept in the Automotive and Energy industries.

SBOM OPTIONS & DECISION POINTS

- Purpose
  - To frame the dimensions for what is possible with modern development practices
  - To support more consistent and effective articulation of needs between requesters and suppliers of SBOMs
- Published on ntia.gov/sbom



Dimension	-	Initial Consensus	+
Baseline Component Information	Contains core subset* of Baseline Component Information attributes	Includes all Baseline Component Information† attributes	Contains component information beyond baseline supportive of high assurance use cases
Format & Machine Readability	SBOM in any machine-readable format (e.g. csv)	SBOM in a baseline-supporting, machine-readable format‡	SBOM in all machine-readable, interoperable formats‡, maintaining currency as standards evolve or emerge
Depth	All primary components with direct dependencies and known-unknowns declared	All primary components with all transitive dependencies and known-unknowns declared	All primary components with all transitive dependencies with no unknowns
Generation Frequency	At time of pre/purchase and/or provided upon request within *x* time	With every update or change to code (major/minor release or patch)	Additionally hosted in an archive for every version
Delivery & Interoperability	Emailed and/or hosted/archived by the supplier	Bundled with every product version and archived by the supplier	Supports machine interfaces (e.g. API) and adjacent interoperability (e.g. DBOM, MUD, OpenC2)
Adjacent Enhancement: Vulnerability Claims	*Supplier makes attestations for potentially exploitable vulnerabilities upon request*	*Supplier makes attestations for potentially exploitable vulnerabilities within x time of a new vulnerability*	*Standardized API query for current attestation of product-specific risks to SBOM components*

* **Core subset of Baseline Component Information:** Component Name, Supplier Name, Version String, Unique Identifier

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‡ **SBOM Formats:** SPDX, CycloneDx, SWID

ntia.gov/sbom

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PERSPECTIVE: ASKING FOR SBOMS

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PERSPECTIVE: SUPPLYING SBOMS

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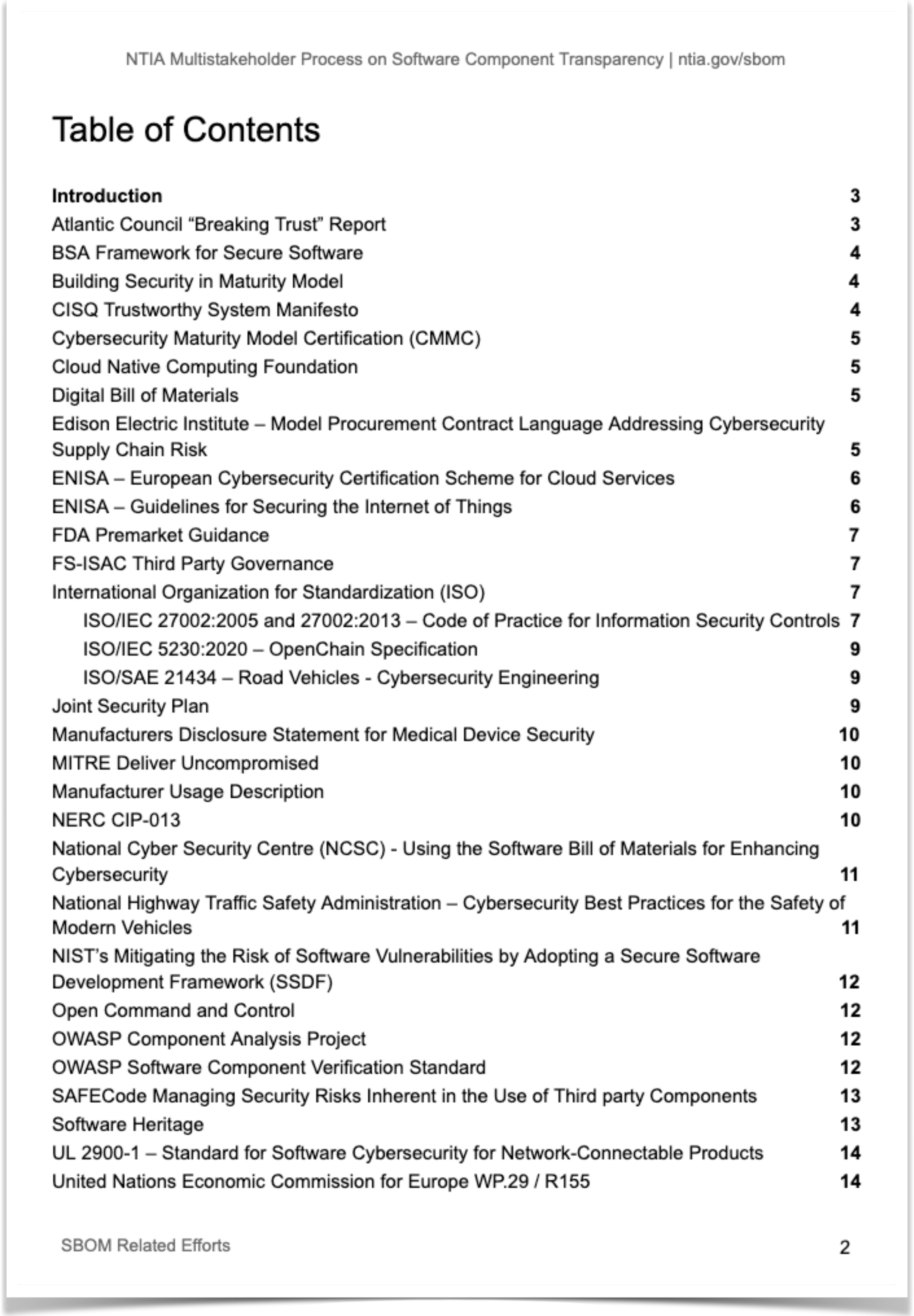
SBOM RELATED EFFORTS

- ➤ Originally Appendix I in “Roles and Benefits for SBOM Across the Supply Chain” Phase I document
- ➤ Releasing as standalone “SBOM Related Efforts” document
- ➤ 15+ Additions and Updates
- ➤ http://bit.ly/sbom-related-efforts



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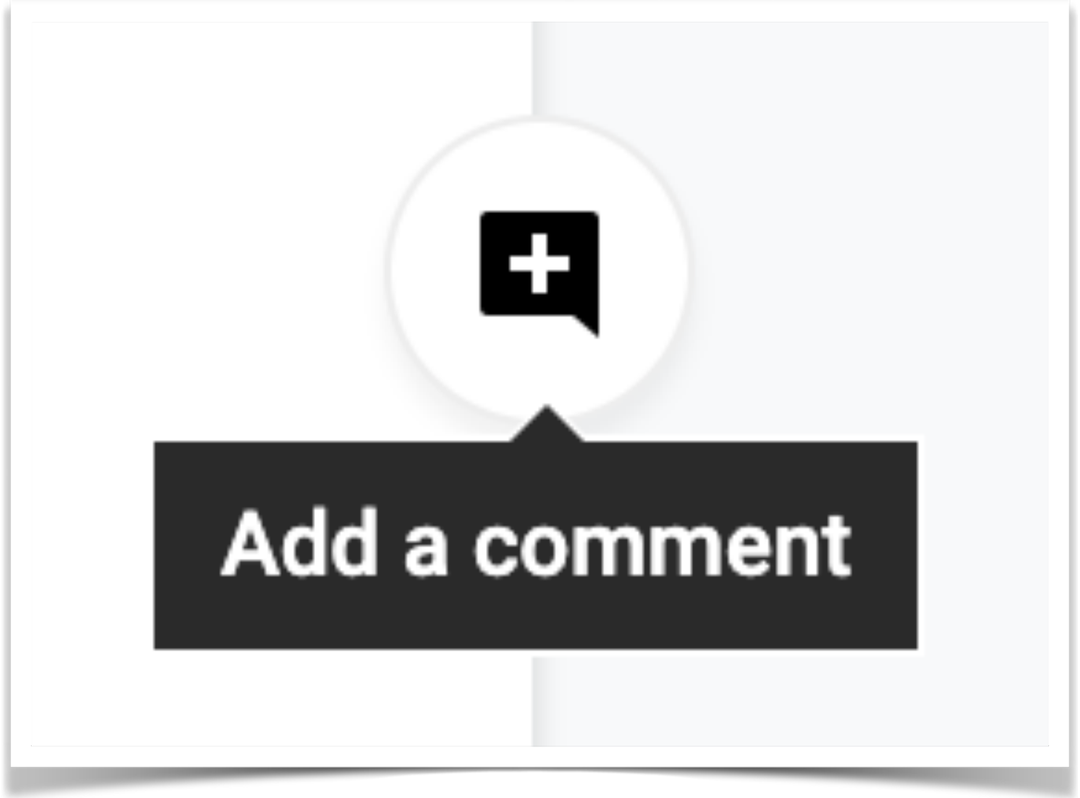
SBOM RELATED EFFORTS - FEEDBACK REQUEST

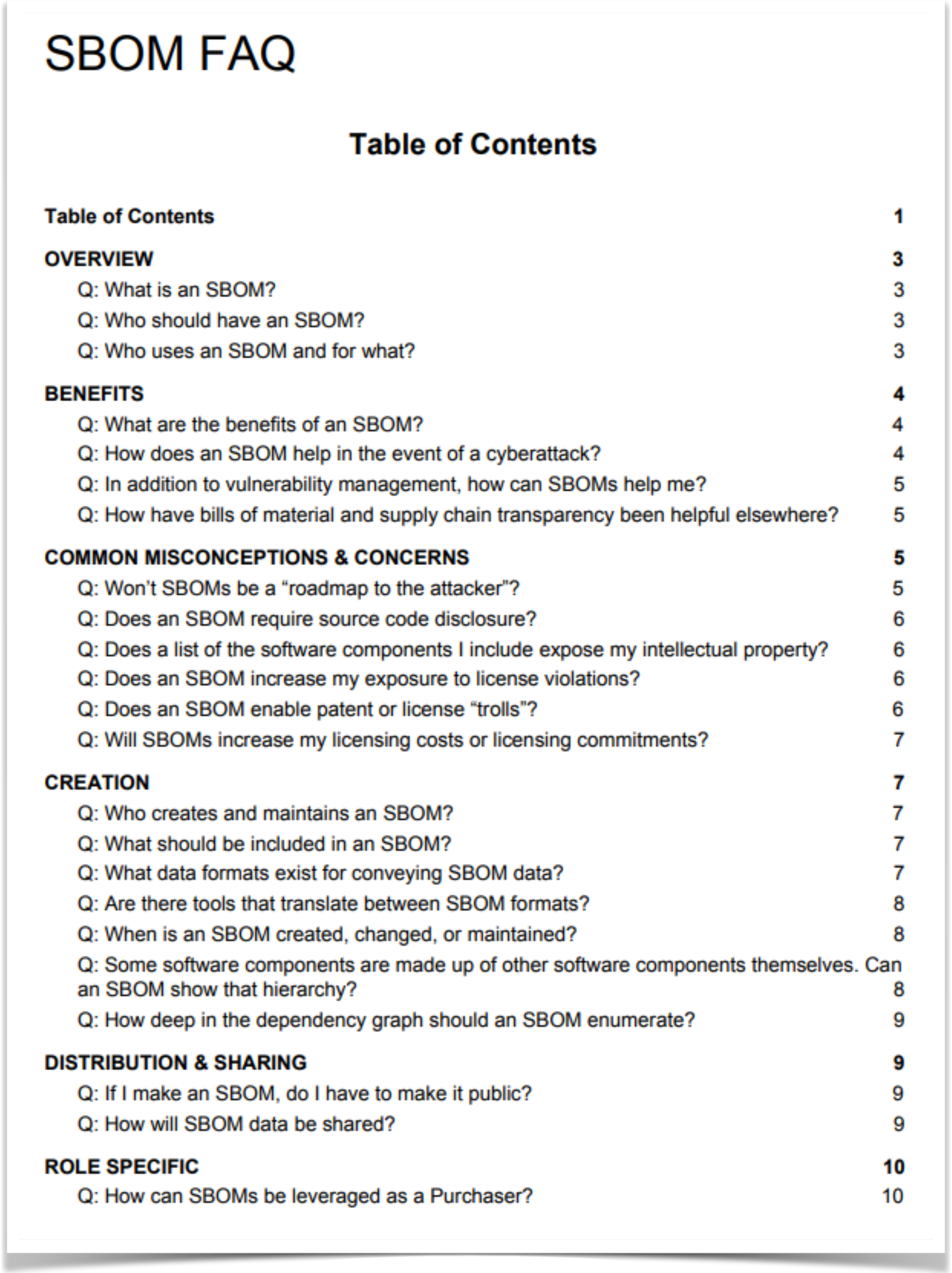
- SBOM Related Efforts prepared for feedback: http://bit.ly/sbom-related-efforts
- Feedback Due: May 14, 2021
- Please provide feedback via “Add a comment” on Google Document:



- Please also nominate new SBOM-related efforts for inclusion.

FAQ

- Published on NTIA SBOM Website:
  - ntia.gov/sbom
- GitHub Mirror of FAQ:
  - https://github.com/NTIADC/SBOM_FAQ/



SBOM FAQ

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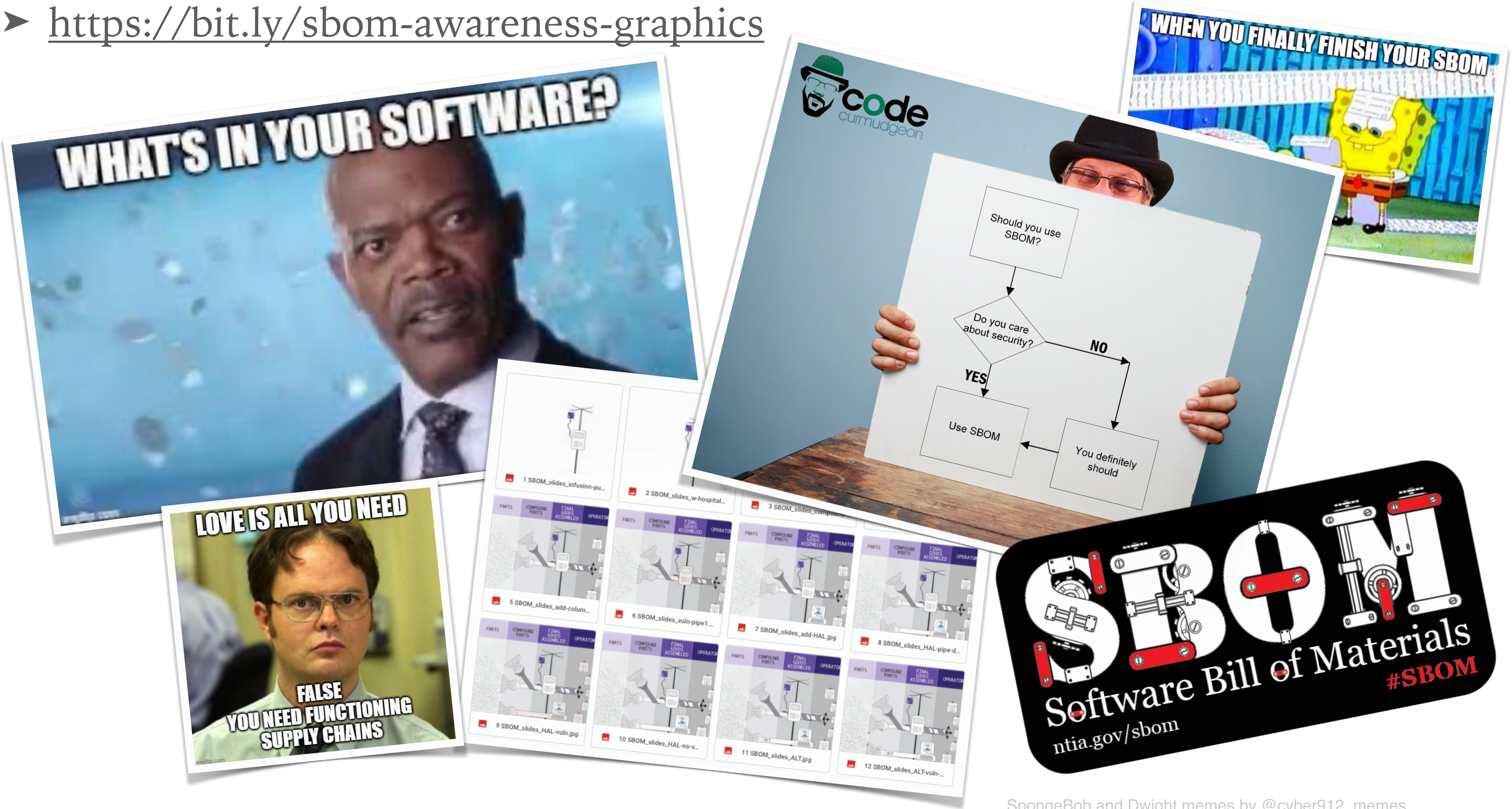
GRAPHICS REPOSITORY*

- ➤ https://bit.ly/sbom-awareness-graphics


WHAT'S IN YOUR SOFTWARE?
LOVE IS ALL YOU NEED
FALSE
YOU NEED FUNCTIONING SUPPLY CHAINS
code curmudgeon
Should you use SBOM?
Do you care about security?
YES
NO
Use SBOM
You definitely should
WHEN YOU FINALLY FINISH YOUR SBOM
SBOM
Software Bill of Materials
#SBOM
ntia.gov/sbom
1 SBOM_slides_infusion-pu...
2 SBOM_slides_w-hospital...
3 SBOM_slides_compound...
5 SBOM_slides_add-colum...
6 SBOM_slides_vuln-pipe1...
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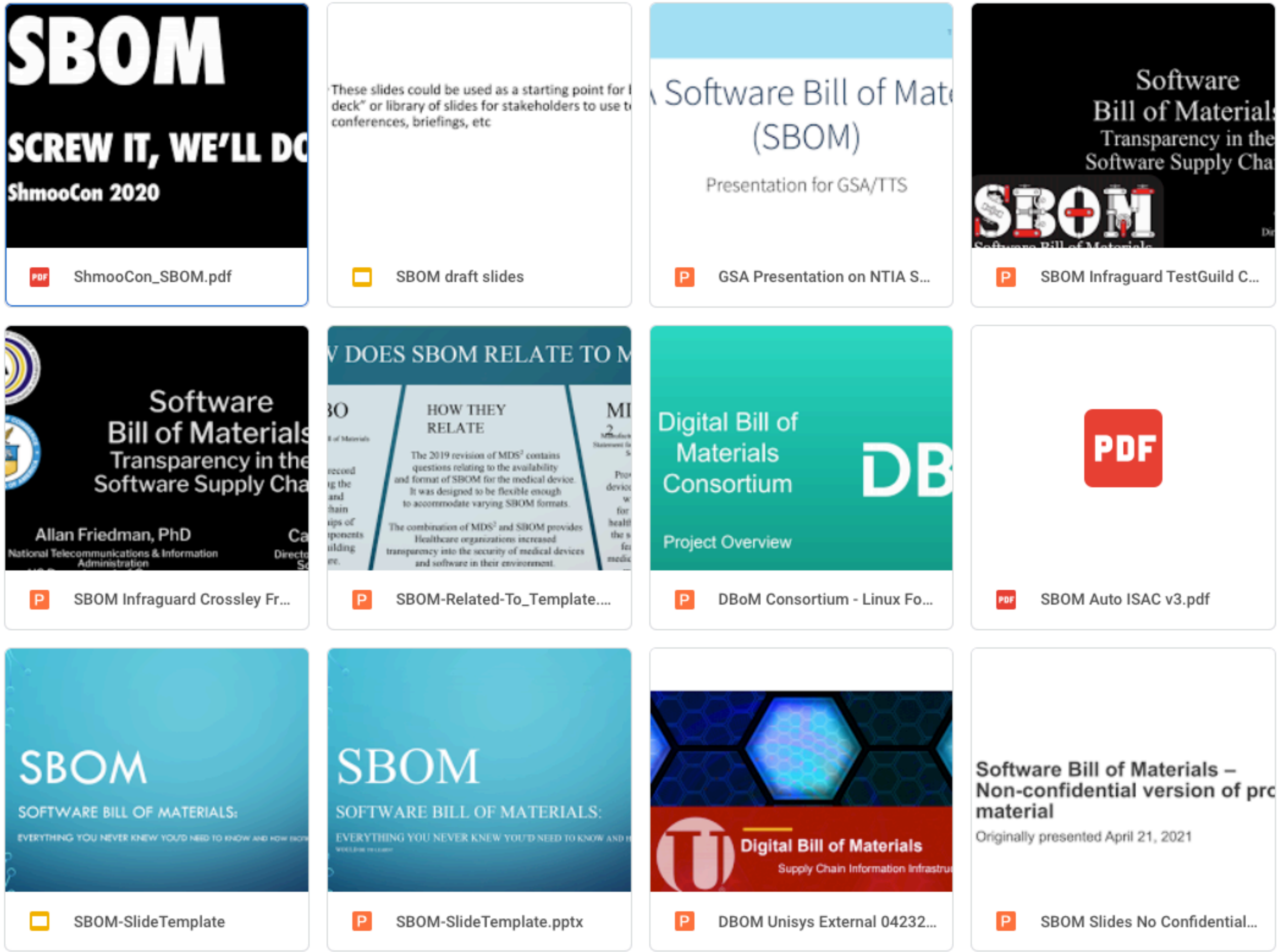
8 SBOM_slides_HAL-pipe-d...
9 SBOM_slides_HAL-vuln.jpg
10 SBOM_slides_HAL-no-v...
11 SBOM_slides_ALT.jpg
12 SBOM_slides_ALT-vuln-...

* Now with memes!

SpongeBob and Dwight memes by @cyber912_memes
Flowchart by @CodeCurmudgeon
SLJ meme via @AlyssaM_InfoSec

SBOM SLIDE REPOSITORY

➤ https://bit.ly/sbom-awareness-slides


SBOM
SCREW IT, WE'LL DC
ShmooCon 2020
These slides could be used as a starting point for ł deck" or library of slides for stakeholders to use t conferences, briefings, etc
Software Bill of Mat (SBOM)
Presentation for GSA/TTS
Software Bill of Material Transparency in the Software Supply Cha
SBOM
Software Bill of Materials Transparency in the Software Supply Cha
Allan Friedman, PhD
National Telecommunications & Information Administration
DOES SBOM RELATE TO M
HOW THEY RELATE
Digital Bill of Materials Consortium
DB
Project Overview
PDF
SBOM
SOFTWARE BILL OF MATERIALS:
EVERYTHING YOU NEVER KNEW YOU'D NEED TO KNOW AND HOW
SBOM
SOFTWARE BILL OF MATERIALS:
EVERYTHING YOU NEVER KNEW YOU'D NEED TO KNOW AND
Digital Bill of Materials
Supply Chain Information Infrastru
Software Bill of Materials – Non-confidential version of prc material
Originally presented April 21, 2021

- ShmooCon_SBOM.pdf
- SBOM draft slides
- GSA Presentation on NTIA S...
- SBOM Infraguard TestGuild C...
- SBOM Infraguard Crossley Fr...
- SBOM-Related-To_Template....
- DBoM Consortium - Linux Fo...
- SBOM Auto ISAC v3.pdf
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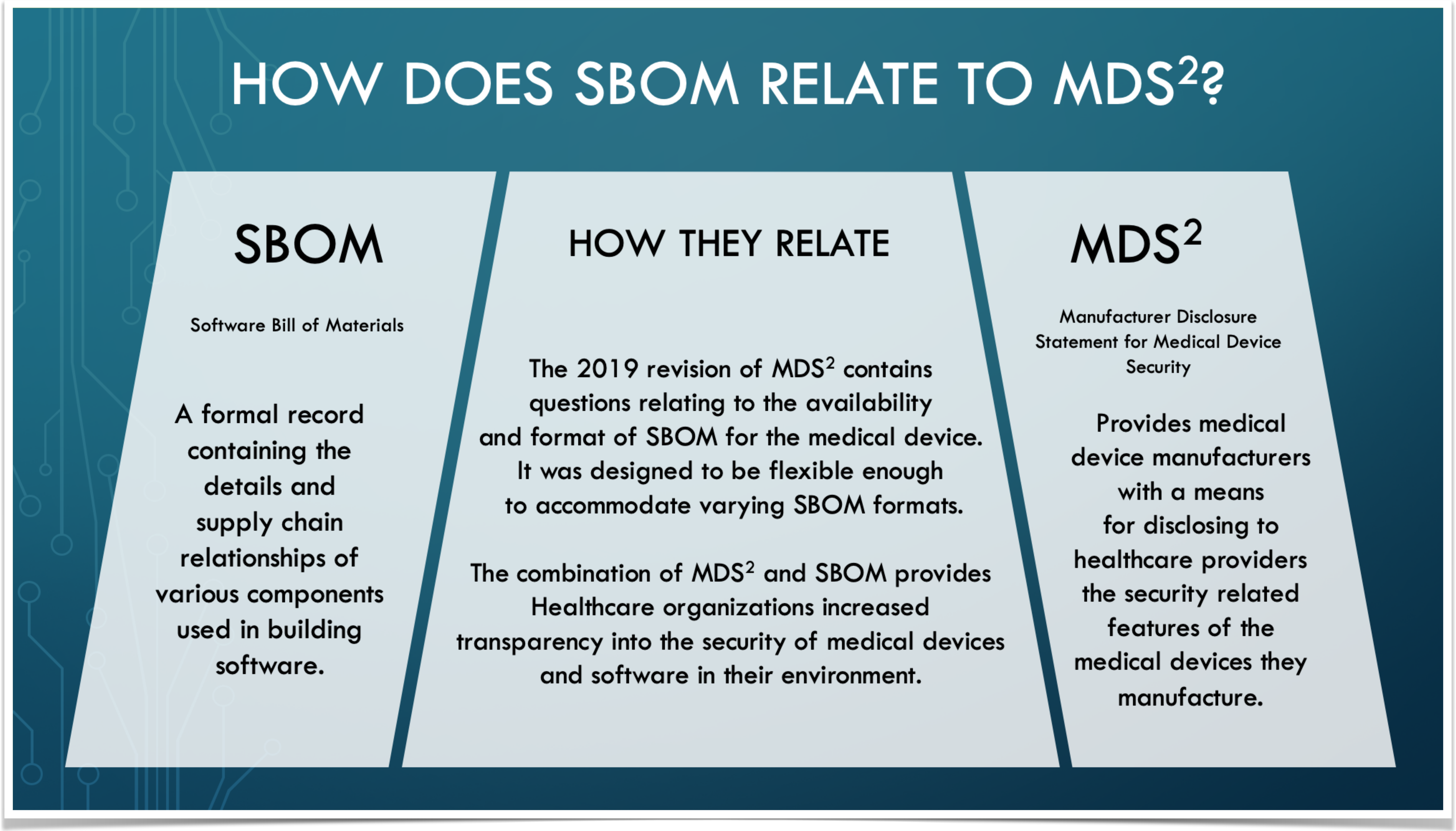
- DBOM Unisys External 04232...
- SBOM Slides No Confidential...

“HOW DOES SBOM RELATE TO…”

- PowerPoint Template: http://bit.ly/sbom-relates-to-ppt



HOW DOES SBOM RELATE TO MDS^2?

SBOM

Software Bill of Materials

A formal record containing the details and supply chain relationships of various components used in building software.

HOW THEY RELATE

The 2019 revision of MDS^2 contains questions relating to the availability and format of SBOM for the medical device. It was designed to be flexible enough to accommodate varying SBOM formats.

The combination of MDS^2 and SBOM provides Healthcare organizations increased transparency into the security of medical devices and software in their environment.

MDS^2

Manufacturer Disclosure Statement for Medical Device Security

Provides medical device manufacturers with a means for disclosing to healthcare providers the security related features of the medical devices they manufacture.

ONGOING EFFORTS

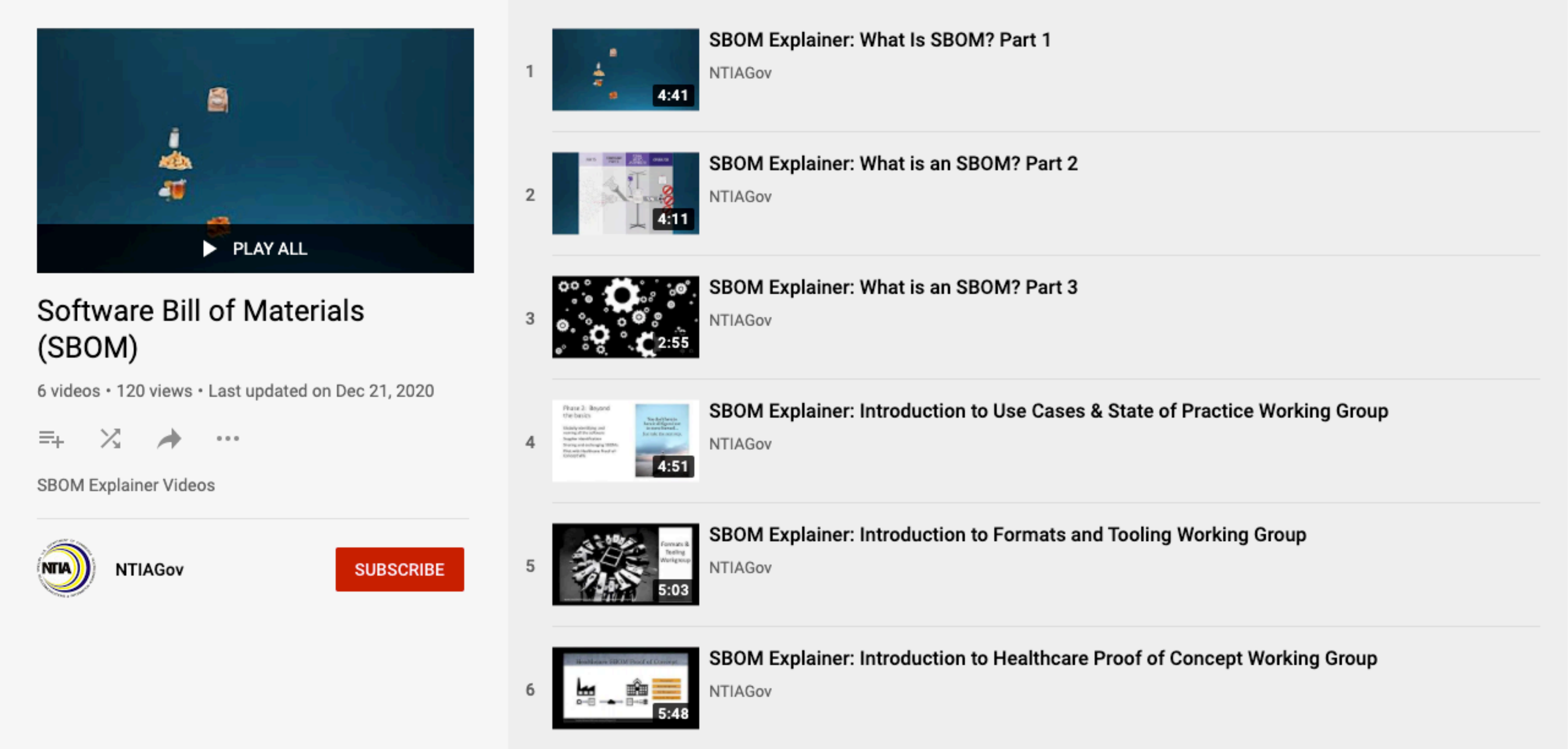
- FAQ
  - Cost and Investment-related questions
- SBOM Perspectives
  - Asking for SBOMs
  - Supplying SBOMs
- Virtual Engagement Opportunities
  - Webinars, Podcasts, Virtual Conferences, Other
  - RSA Conference 2021: SBOM & Supply Chain Content
- Business Two-Pager being reworked into two documents:
  - Business Customer
  - Producer
- SBOM Related Efforts & SBOM-Adjacent Topics Spreadsheet
- Questions for your Suppliers
- Proof of Concept Conversations & Expansions
- Knowledge Base - Searchable, cross-linked Phase I Documents

ADDITIONAL SBOM RESOURCES

- SBOM News:
  - https://bit.ly/sbom-awareness-news
- SBOM Recordings, Presentations, and Podcasts:
  - https://bit.ly/sbom-awareness-recordings
- If you have a news story, recording, presentation, or podcast to add to the lists, please submit a comment in the Google Doc.

PHASE I SBOM EXPLAINER VIDEOS

- Available on YouTube:
  - https://www.youtube.com/playlist?list=PLO2lqCK7WyTDpVmcHsy6R2HWftFkUp6zG



Software Bill of Materials (SBOM)

6 videos • 120 views • Last updated on Dec 21, 2020

SBOM Explainer Videos

NTIAGov

1 SBOM Explainer: What Is SBOM? Part 1 — NTIAGov — 4:41

2 SBOM Explainer: What is an SBOM? Part 2 — NTIAGov — 4:11

3 SBOM Explainer: What is an SBOM? Part 3 — NTIAGov — 2:55

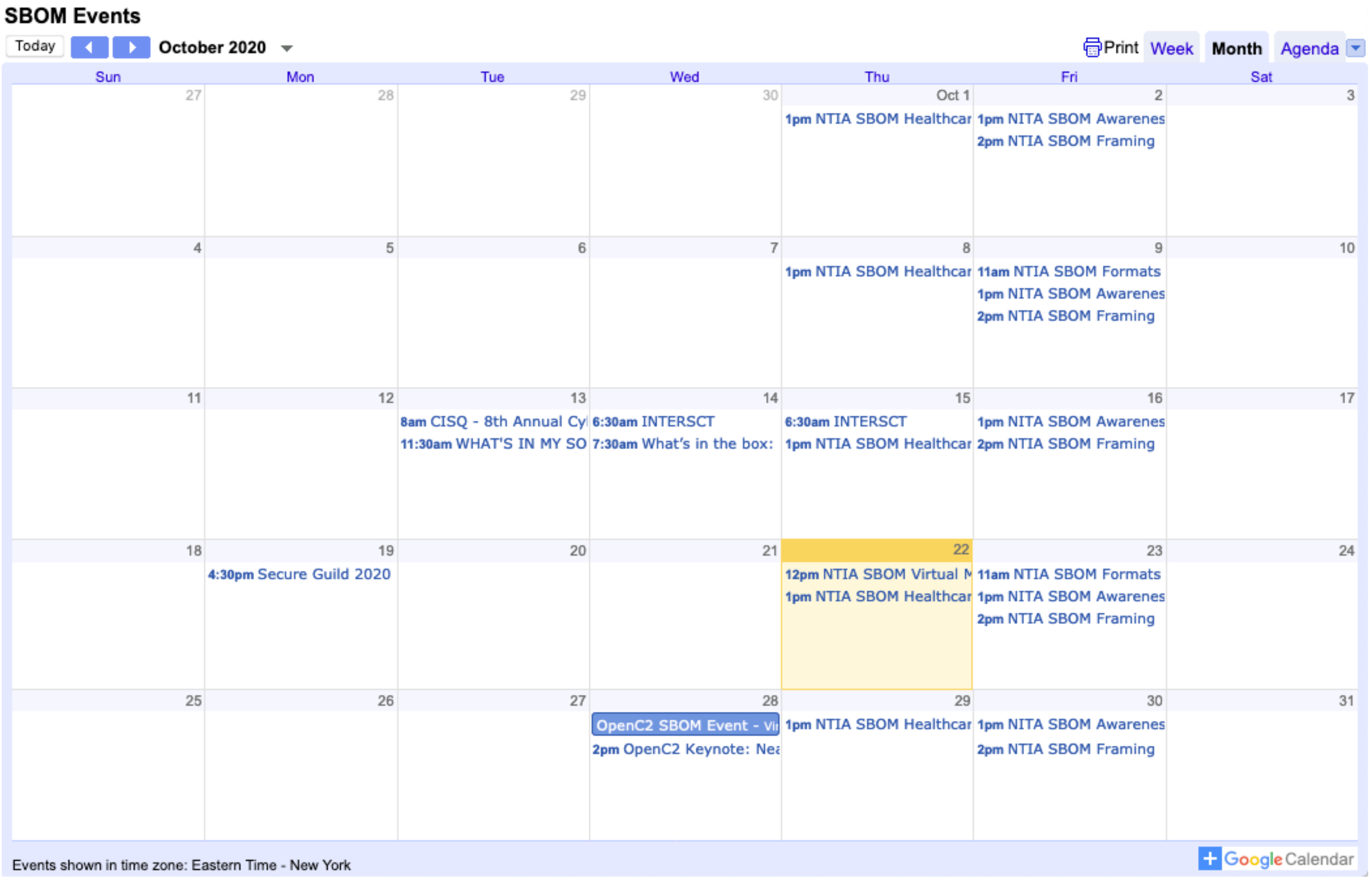
4 SBOM Explainer: Introduction to Use Cases & State of Practice Working Group — NTIAGov — 4:51

5 SBOM Explainer: Introduction to Formats and Tooling Working Group — NTIAGov — 5:03

6 SBOM Explainer: Introduction to Healthcare Proof of Concept Working Group — NTIAGov — 5:48

- Also linked to on ntia.gov/sbom

SBOM EVENTS CALENDAR



SBOM Events

Sun	Mon	Tue	Wed	Thu	Fri	Sat
27	28	29	30	Oct 1 1pm NTIA SBOM Healthcar	2 1pm NTIA SBOM Awarenes 2pm NTIA SBOM Framing	3
4	5	6	7	8 1pm NTIA SBOM Healthcar	9 11am NTIA SBOM Formats 1pm NTIA SBOM Awarenes 2pm NTIA SBOM Framing	10
11	12	13 8am CISQ - 8th Annual Cy 11:30am WHAT'S IN MY SO	14 6:30am INTERSCT 7:30am What's in the box:	15 6:30am INTERSCT 1pm NTIA SBOM Healthcar	16 1pm NTIA SBOM Awarenes 2pm NTIA SBOM Framing	17
18	19 4:30pm Secure Guild 2020	20	21	22 12pm NTIA SBOM Virtual M 1pm NTIA SBOM Healthcar	23 11am NTIA SBOM Formats 1pm NTIA SBOM Awarenes 2pm NTIA SBOM Framing	24
25	26	27	28 OpenC2 SBOM Event - Vi 2pm OpenC2 Keynote: Nea	29 1pm NTIA SBOM Healthcar	30 1pm NTIA SBOM Awarenes 2pm NTIA SBOM Framing	31

Events shown in time zone: Eastern Time - New York

SBOM EVENTS CALENDAR

- View SBOM Events Calendar: https://bit.ly/sbom-calendar-public
- Subscribe to SBOM Events Calendar: https://bit.ly/sbom-calendar-subscribe

- To submit SBOM-related events or talks for inclusion, email details and/or forward an existing calendar invitation to:
  - sbom.calendar@gmail.com

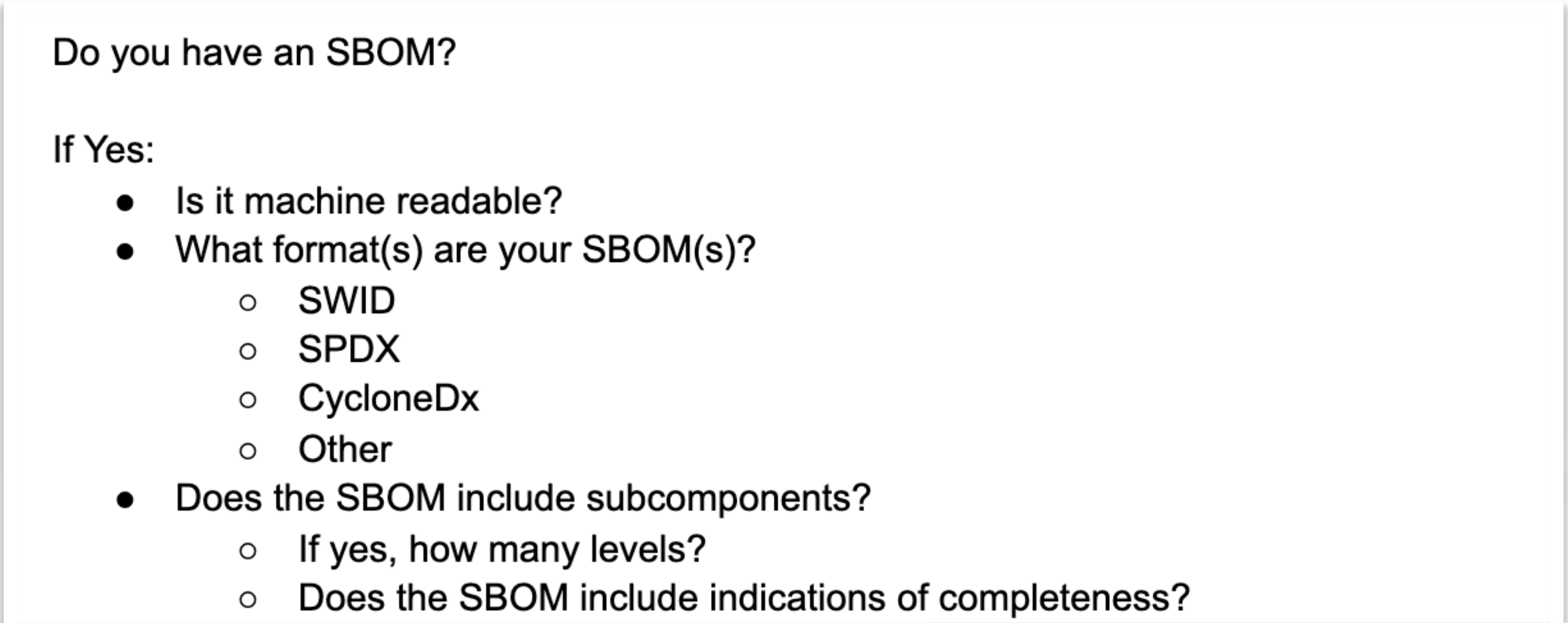
  - Include:
    - Event Title, Time, & Time Zone
    - Location & Cost, if applicable
    - Description
    - Link to registration or more information

SBOM-ADJACENT TOPICS SPREADSHEET

- Anomalous Software Detection
- BSA Framework
- BSIMM
- CISQ
- CVE
- CycloneDx
- DBOM
- DevSecOps
- End of Life Management
- FDA Premarket Guidance
- FS-ISAC Controls
- Hardware BOMs
- ISO Security Standards
- Joint Security Plan (JSP)
- License Management
- MDS2
- MITRE’s Deliver Uncompromised
- MUD
- NERC CIP 13
- NIST SSDF
- OpenC2
- OpenChain
- OWASP Component Analysis
- OWASP SCVS
- Package URL
- Procurement
- Runtime monitoring
- SAFE Code 3rd Party Guidance
- SBOM Integrity Monitoring
- SCAP
- SCRM
- Software Dependencies
- Software Heritage
- SPDX
- Supply Chain Attack Detection
- SWID
- Vulnerability Management
- Vulnerability Prioritization
- WP.29

QUESTIONS FOR YOUR SUPPLIERS

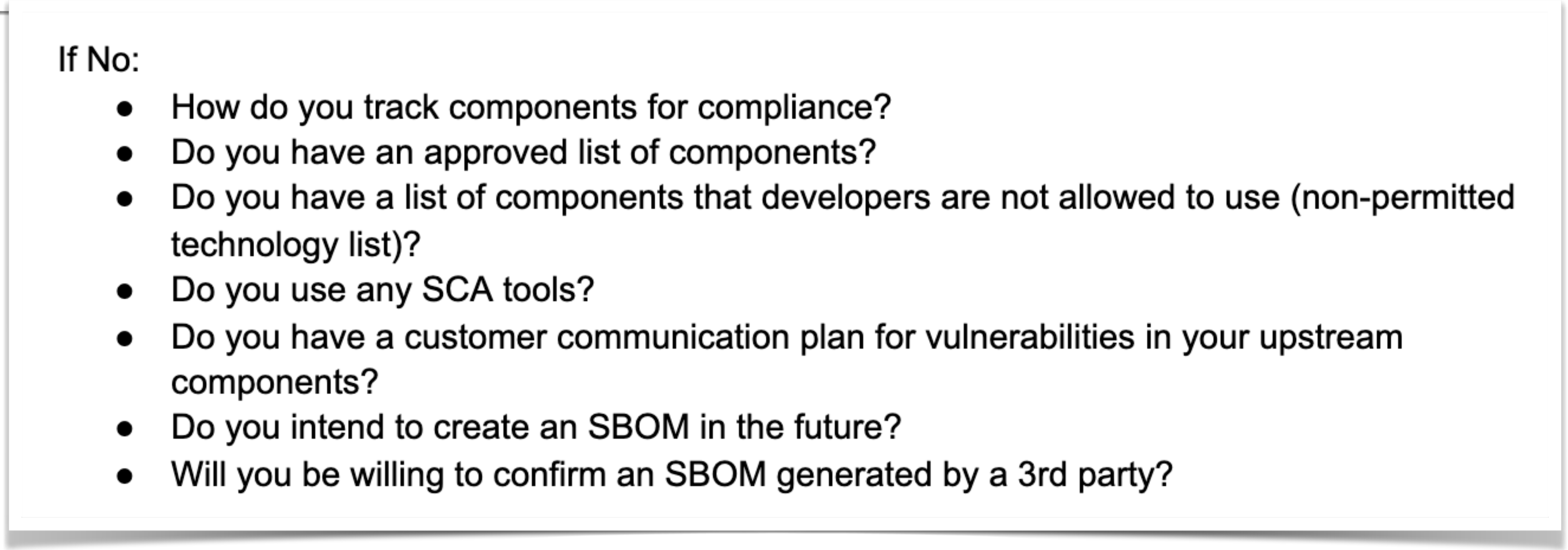
- Link to document listing questions to ask your suppliers about SBOM:
  - http://bit.ly/sbom-questions-for-suppliers



Do you have an SBOM?

If Yes:

- Is it machine readable?
- What format(s) are your SBOM(s)?
  - SWID
  - SPDX
  - CycloneDx
  - Other
- Does the SBOM include subcomponents?
  - If yes, how many levels?
  - Does the SBOM include indications of completeness?



If No:

- How do you track components for compliance?
- Do you have an approved list of components?
- Do you have a list of components that developers are not allowed to use (non-permitted technology list)?
- Do you use any SCA tools?
- Do you have a customer communication plan for vulnerabilities in your upstream components?
- Do you intend to create an SBOM in the future?
- Will you be willing to confirm an SBOM generated by a 3rd party?

FUTURE INITIATIVES & IDEAS FOR 2021

- Use Case Repository
- SBOM Starter Slides
- NTIA GitHub
- Additional SBOM Surveys
- Journeys & Playbooks
- Additional Explainer Videos
- Revisit Outreach Strategy
- Proof of Concept Virtual Summit
- Other Virtual Conference Opportunities
- SBOM SWAG

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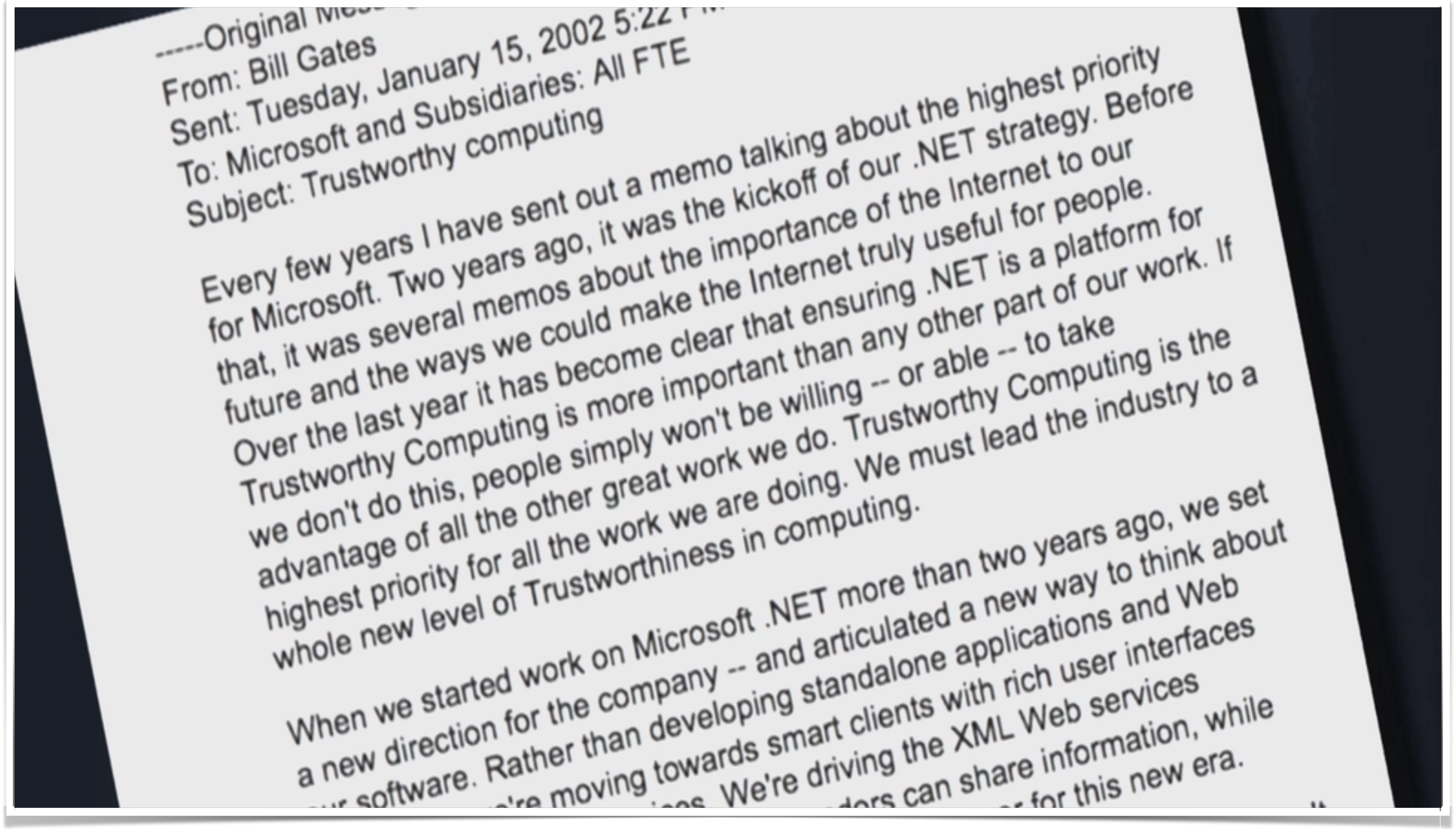
TRUST & TRUSTWORTHINESS



-----Original Mes

From: Bill Gates

Sent: Tuesday, January 15, 2002 5:22 P

To: Microsoft and Subsidiaries: All FTE

Subject: Trustworthy computing

Every few years I have sent out a memo talking about the highest priority for Microsoft. Two years ago, it was the kickoff of our .NET strategy. Before that, it was several memos about the importance of the Internet to our future and the ways we could make the Internet truly useful for people. Over the last year it has become clear that ensuring .NET is a platform for Trustworthy Computing is more important than any other part of our work. If we don't do this, people simply won't be willing -- or able -- to take advantage of all the other great work we do. Trustworthy Computing is the highest priority for all the work we are doing. We must lead the industry to a whole new level of Trustworthiness in computing.

When we started work on Microsoft .NET more than two years ago, we set a new direction for the company -- and articulated a new way to think about ur software. Rather than developing standalone applications and Web 're moving towards smart clients with rich user interfaces ices. We're driving the XML Web services dors can share information, while r for this new era.

TRANSPARENCY IS COMING

Generated by Font-Generator.com

iamthecavalry.org

I AM THE Cavalry

SBOM IS COMING

iamthecavalry.org

SBOM IS HERE

“The future is already here — it’s just not very evenly distributed.”

– William Gibson

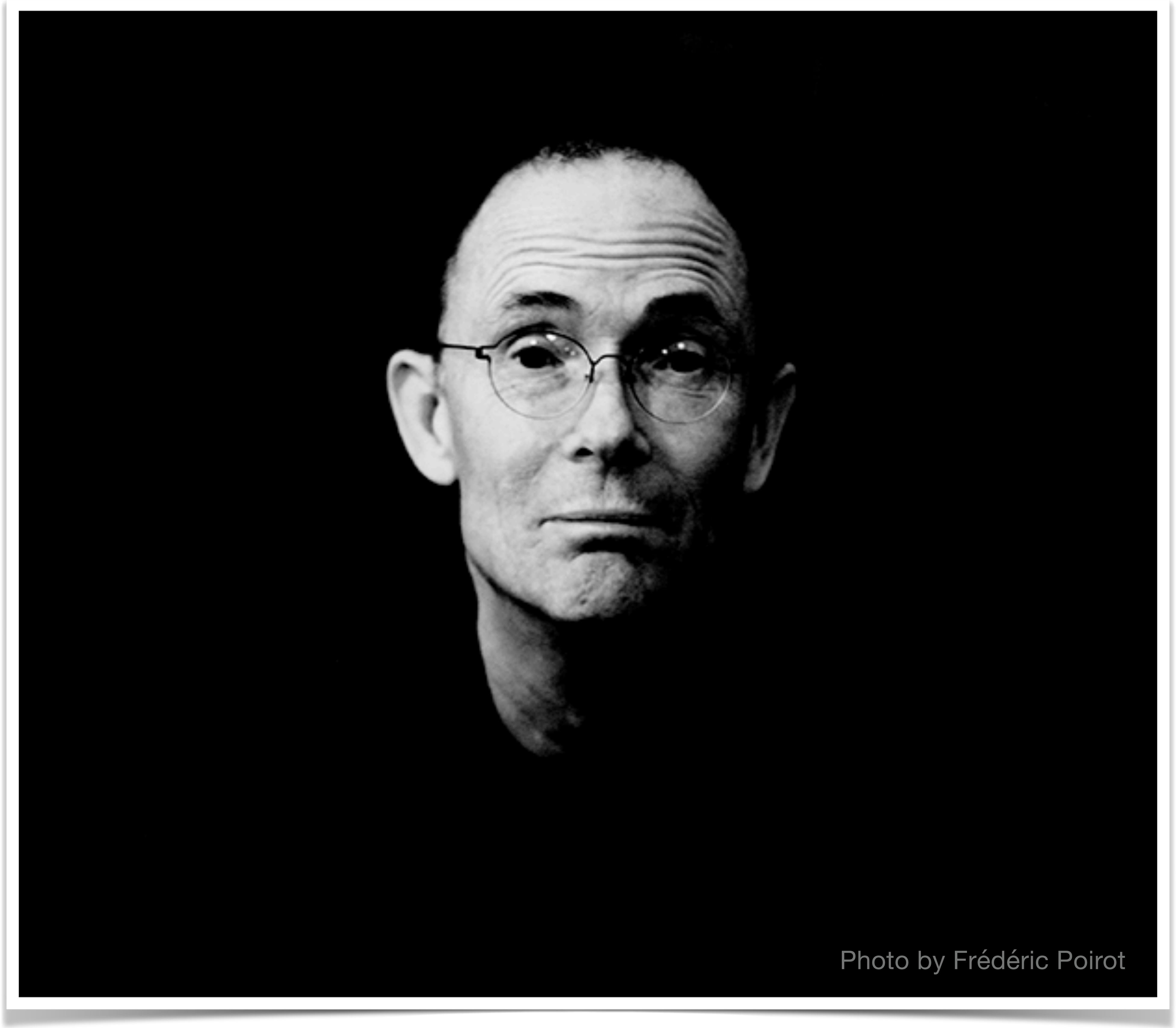
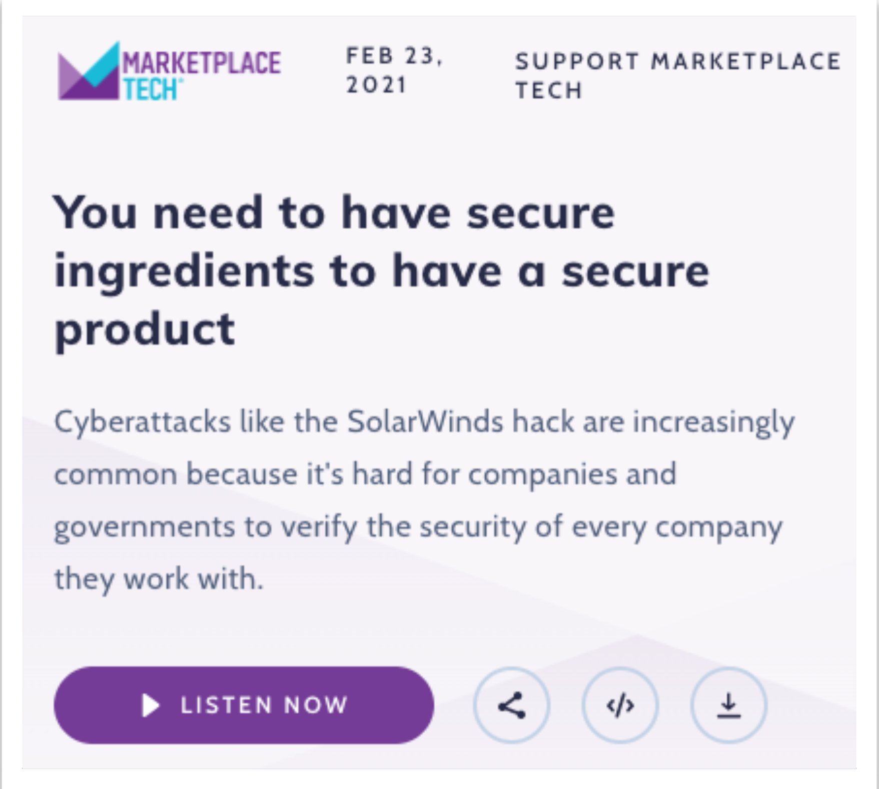


Photo by Frédéric Poirot

CRITICAL MASS



MARKETPLACE TECH FEB 23, 2021 SUPPORT MARKETPLACE TECH

You need to have secure ingredients to have a secure product

Cyberattacks like the SolarWinds hack are increasingly common because it's hard for companies and governments to verify the security of every company they work with.

▶ LISTEN NOW

TAG Cyber
Security Annual
2ND QUARTER 2021
MARKET OUTLOOK & INDUSTRY INSIGHTS
OP-ED

THE TIME HAS ARRIVED FOR SOFTWARE BILL OF MATERIALS

EDWARD AMOROSO

The benefits of Software Bill of Materials (SBOM) are outlined in the context of standards such as SWID and SPDX from NTIA, ISO, CycloneDX, and the Linux Foundation. To address challenges in implementation, a maturity model is proposed here to enable use of SBOM in practical software procurement settings.

INTRODUCTION

Allan Friedman from the US Department of Commerce illustrates a bill of materials this way: "Twinkie buyers often assume the product to be vegan," he says, "but a glance at the list of ingredients reveals use of beef fat." Yeech. Now – after the inevitable joke that even hungry rats sniff-and-pass at Twinkies, one must admit that if junk food makers can be forced to share their ingredients, then so should software providers.

Stated simply – the time has arrived for a software bill of materials to accompany any code being delivered into a consequential setting, which means pretty much all software. Blessed with a pronounceable acronym – SBOM, the concept seems to polarize observers into two camps: The true believing camp and the no-way-you-can-do-it camp. Below, we examine both arguments – and hopefully convince you that the title of this article is correct.

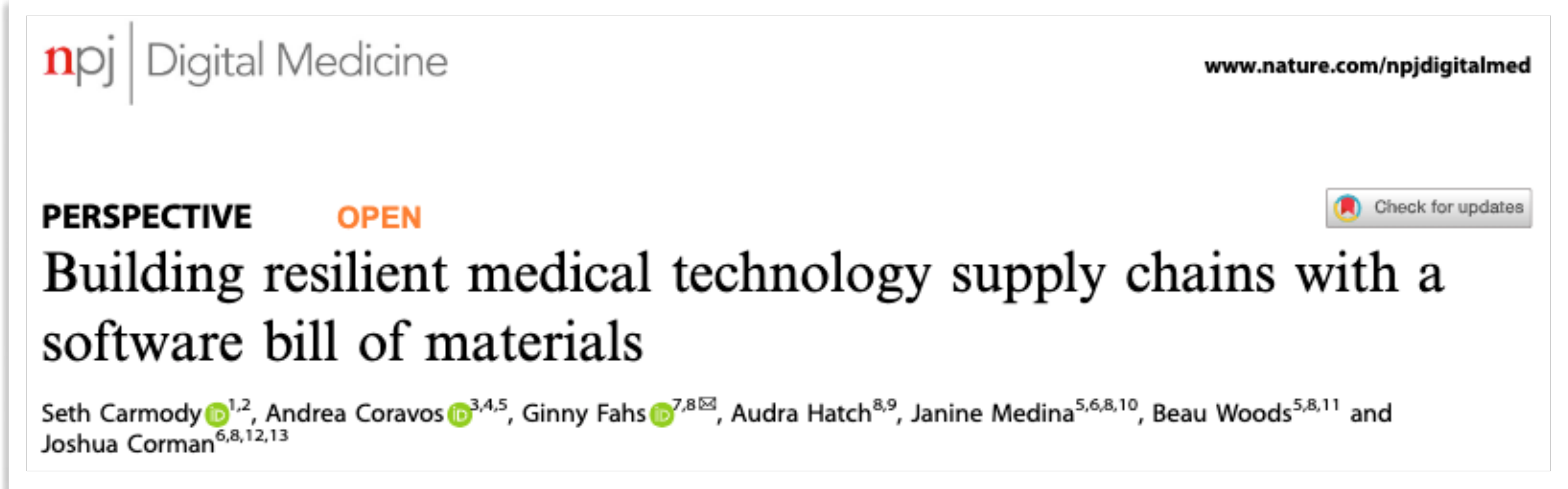
Specifically, we cover the major arguments for and against SBOM, including a summary of ongoing contributions from several major organizations including NTIA, ISO, CycloneDX, and the Linux Foundation. We also propose here an SBOM maturity scale that allows software providers to provide guidance on the level of assurance that exists in their SBOM. Such claims should assist buyers in their software procurement activity.

CASE FOR SBOM

The conceptual notion of a software bill of materials is simple: Buyers of software would demand a nested inventory of the components used to develop the product or system. The resulting transparency would help buyers establish higher levels of assurance for software

The approach has the potential to help address the crisis the security community is currently experiencing in supply chain risk management.

2021 SECURITY ANNUAL • 2nd QUARTER 9 TAG CYBER



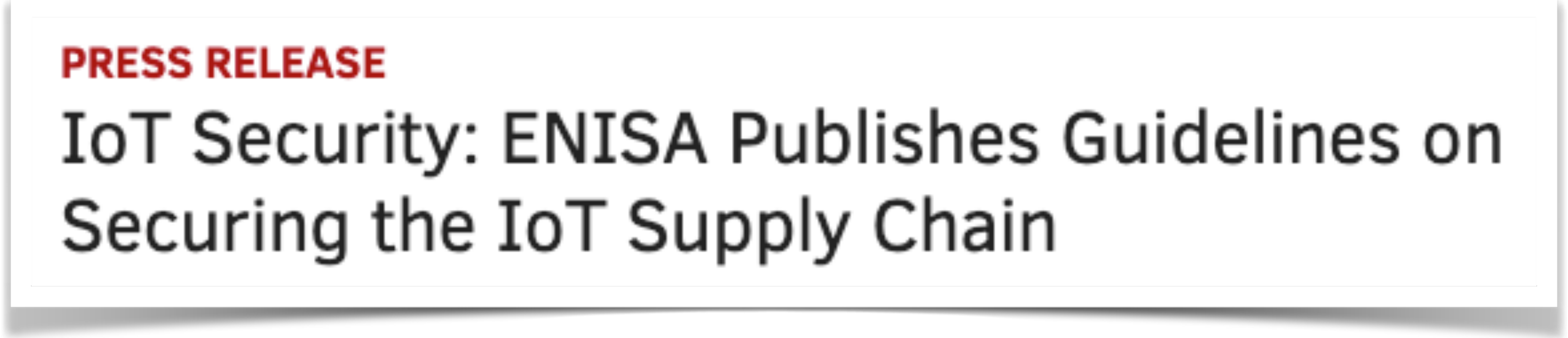
npj | Digital Medicine www.nature.com/npjdigitalmed

PERSPECTIVE OPEN

Check for updates

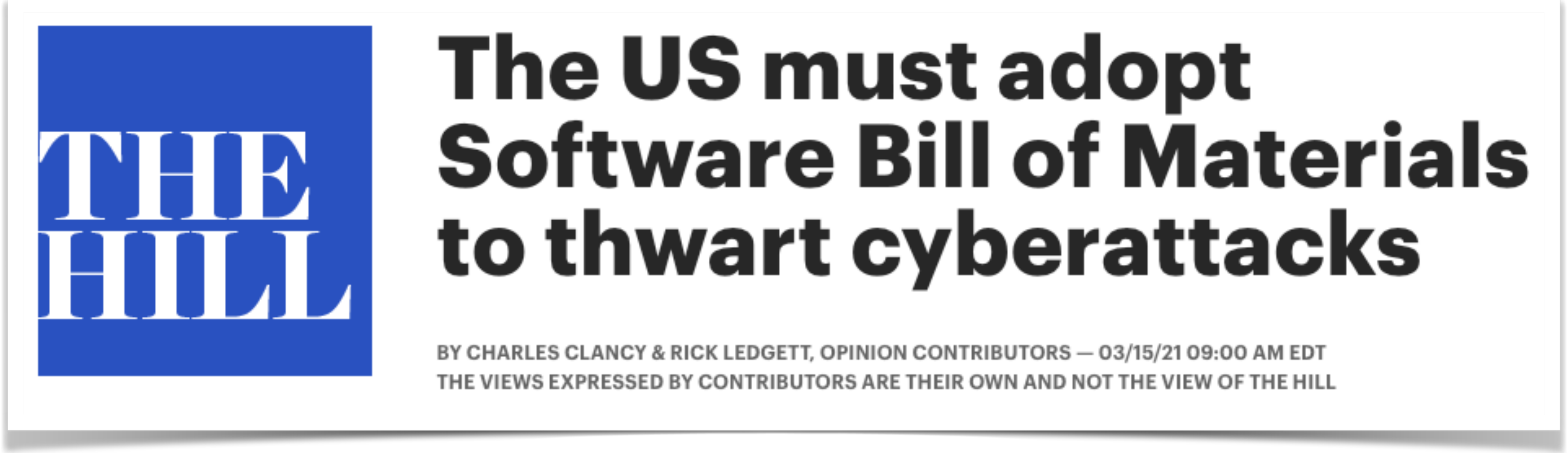
Building resilient medical technology supply chains with a software bill of materials

Seth Carmody[1,2], Andrea Coravos[3,4,5], Ginny Fahs[7,8], Audra Hatch[8,9], Janine Medina[5,6,8,10], Beau Woods[5,8,11] and Joshua Corman[6,8,12,13]



PRESS RELEASE

IoT Security: ENISA Publishes Guidelines on Securing the IoT Supply Chain

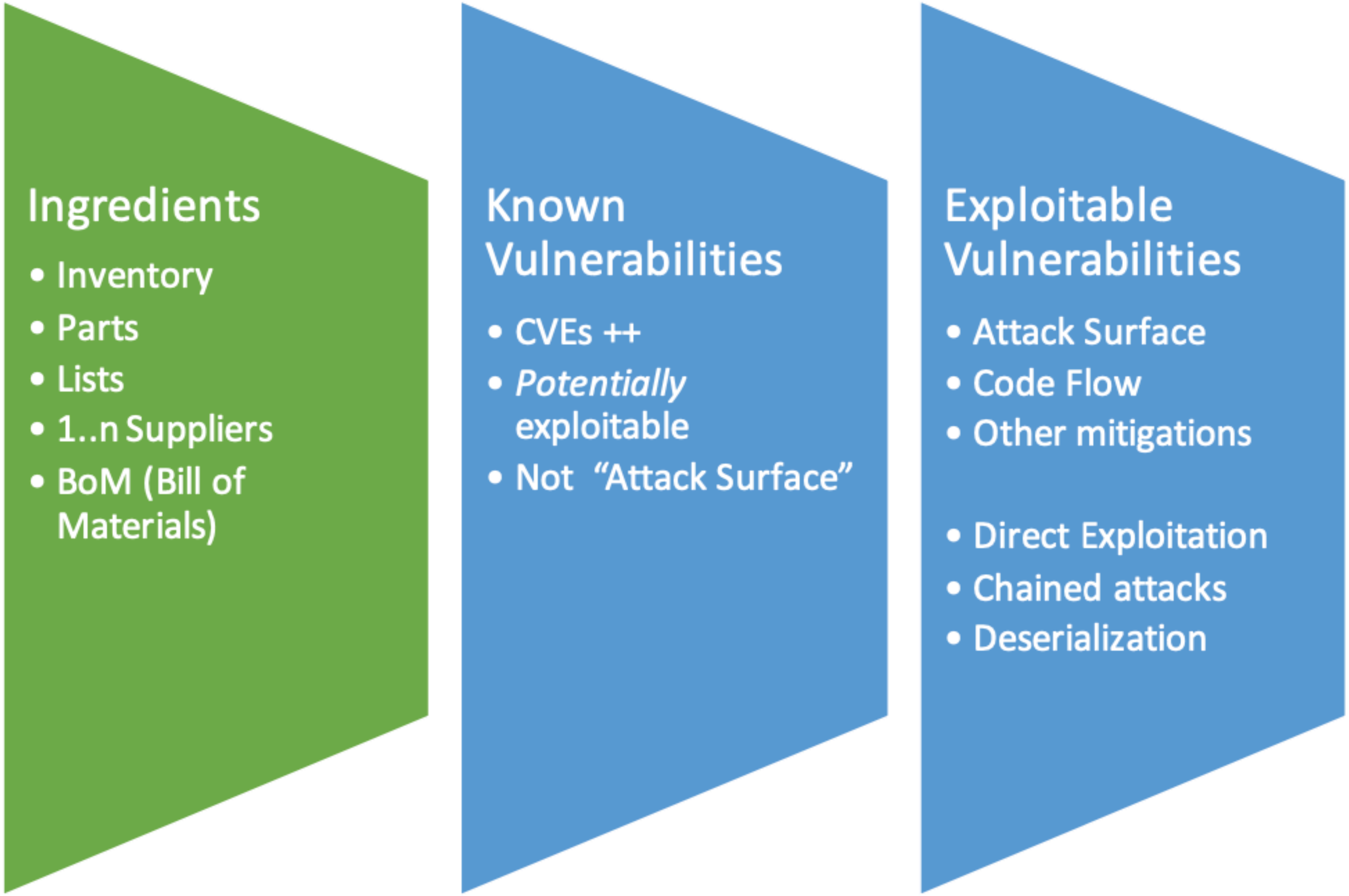


THE HILL

The US must adopt Software Bill of Materials to thwart cyberattacks

BY CHARLES CLANCY & RICK LEDGETT, OPINION CONTRIBUTORS — 03/15/21 09:00 AM EDT
THE VIEWS EXPRESSED BY CONTRIBUTORS ARE THEIR OWN AND NOT THE VIEW OF THE HILL

POST-SBOM ACCELERATION



Ingredients

- Inventory
- Parts
- Lists
- 1..n Suppliers
- BoM (Bill of Materials)

Known Vulnerabilities

- CVEs ++
- *Potentially* exploitable
- Not "Attack Surface"

Exploitable Vulnerabilities

- Attack Surface
- Code Flow
- Other mitigations

- Direct Exploitation
- Chained attacks
- Deserialization

COMMUNITY ASK

- How you can help Awareness & Adoption:
  - We are seeking **new participants** and **project leads** for ongoing efforts
  - Provide feedback on SBOM Related Efforts document
  - Watch, share, and **add to** list of public recordings
  - Submit upcoming events to the SBOM Calendar
  - Introductions to creative colleagues and contributors (e.g. marketing, design, developer relations, etc.) + new industry participants

- How can Awareness & Adoption help you?
  - What other resources do you need?
  - How can we improve existing resources?
  - Do our future initiatives and priorities align with yours?

RESOURCES

- README:
  - https://bit.ly/sbom-awareness-readme
- Google Drive Folder:
  - http://bit.ly/sbom-awareness-google-drive
- Meeting Notes:
  - http://bit.ly/sbom-awareness-meeting-notes

JOIN US

- Awareness & Adoption Meeting
  - Fridays at 1:00 PM ET
  - Join the working group: https://lists.sei.cmu.edu/mailman/listinfo/ntia-sbom-practices
- Mailing List
  - ntia-sbom-practices@cert.org

THANK YOU!

Q & A