

# Enhancing Learning Environments with Stories-as-a-Service:

How Content Collection, Automated Tagging, and  
Service Architectures Enable Knowledge Sharing



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# Motivation

Make stories available to training & education on-demand, when learner is doing or thinking something that makes a story instructionally meaningful

WHAT: Enhance digital learning systems with informal instruction

- Tacit knowledge transferred from experts/peers during routine interaction
- Making “war stories” available within or beyond workplace

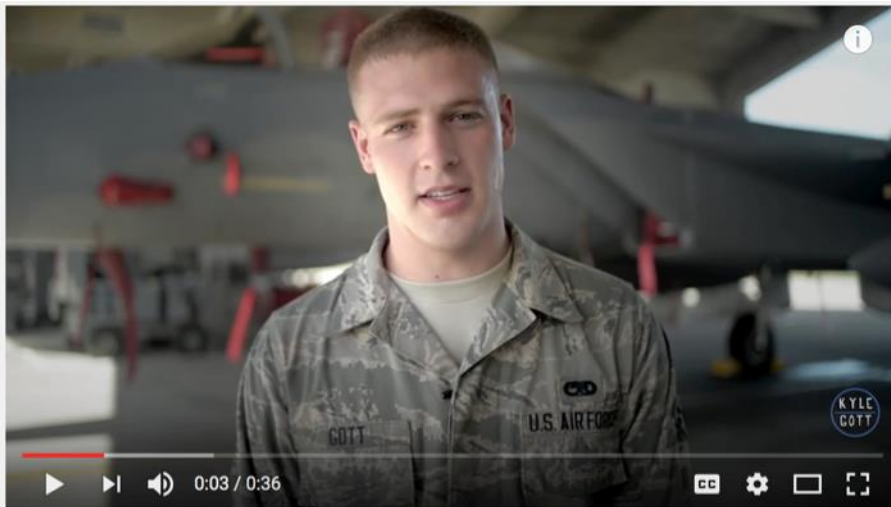
HOW Augment any API-compliant learning environment w/”Story Appliance”

- Create SOA capability to offer client learning applications *Stories-as-a-Service*
- Develop simple, flexible indexing organizes stories for instructional relevance
- Build story collection platform and story browsing interface

Sponsor: Advanced Distributed Learning Initiative

# Armed Forces Interest in Video Stories

- Stories for recruiting, public affairs, education, training
- Online video collections professionally produced, edited
- Organized by high level topics areas or general questions



Airman Video Contest, AFBlueTube



armystrongstories.com

# Limitations of Today's Practices

- Online video collections
  - Purpose-built and labor-intensive
  - No (or limited) meta-tagging
  - Content is siloed



Veterans Affairs (recovery, addiction, depression)

- Result: Good content but not scalable/repurposeable



Ask a Marine, Marines.mil Youtube Channel



#AskASailor, America's Navy Youtube Channel

# Project Objectives

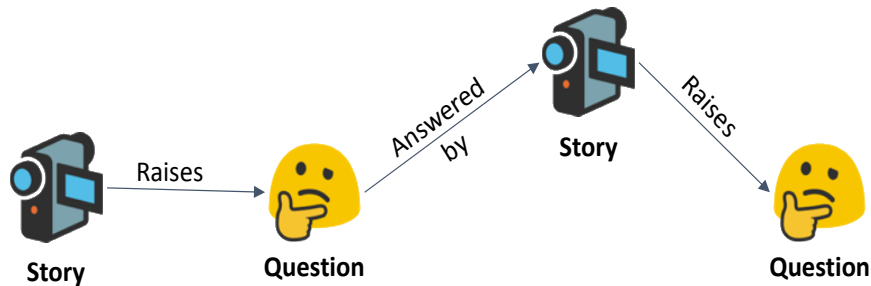
- Encapsulate tangible, relevant content in stories
  - lessons learned, advice, warnings, tradecraft
- Enhance Training Simulations with Video Stories
  - Tacit knowledge transfer via 1st-person “war stories”
  - Long-standing practice across diversity of communities



# Augmenting Next-Generation Learning Environments with Stories ANGLES

- Content meta-tagging/indexing
- Story Collection
- Client Learning App
- Sample Videos
- API
- Storyboard

# Linking Stories w/Question Indexing



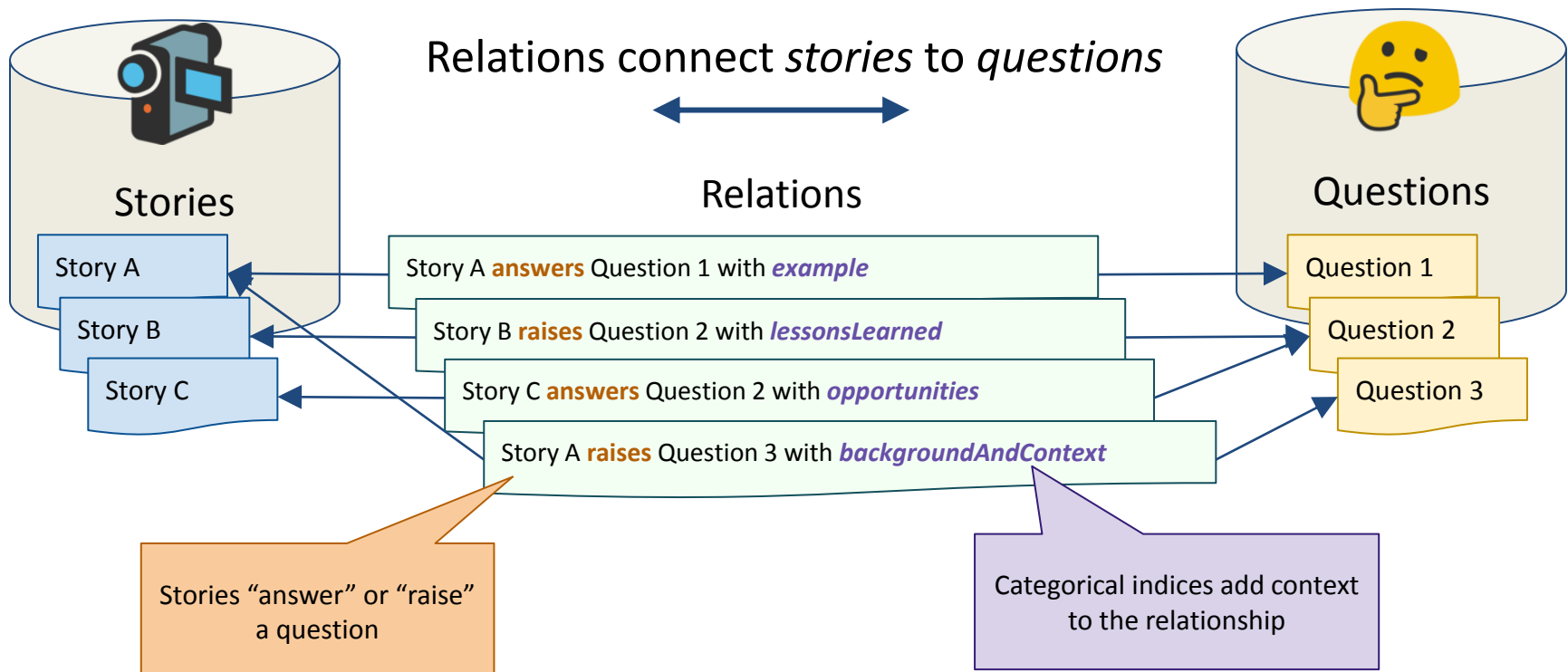
- A story is related to other stories...
  - It raises questions another answers
  - It answers questions raised by others
- Questions can be coded thematically

- ACOA: **Alternative Courses of Action** to the advice discussed in the story
- TT: **Tips & Techniques** that can be extracted from the story
- EX: **Examples** of the issue discussed in story
- C: **Consequences** or later events following the situation discussed in the story
- LL: **Lessons Learned** from the story
- BC: **Background & Context** that led to the situation discussed in the story
- IW: **Indicators & Warnings** about the situation discussed in the story
- RM: **Response Measures** that were taken in the story
- O: **Opportunities** related to the situation discussed in the story



# Story and Question Data Models

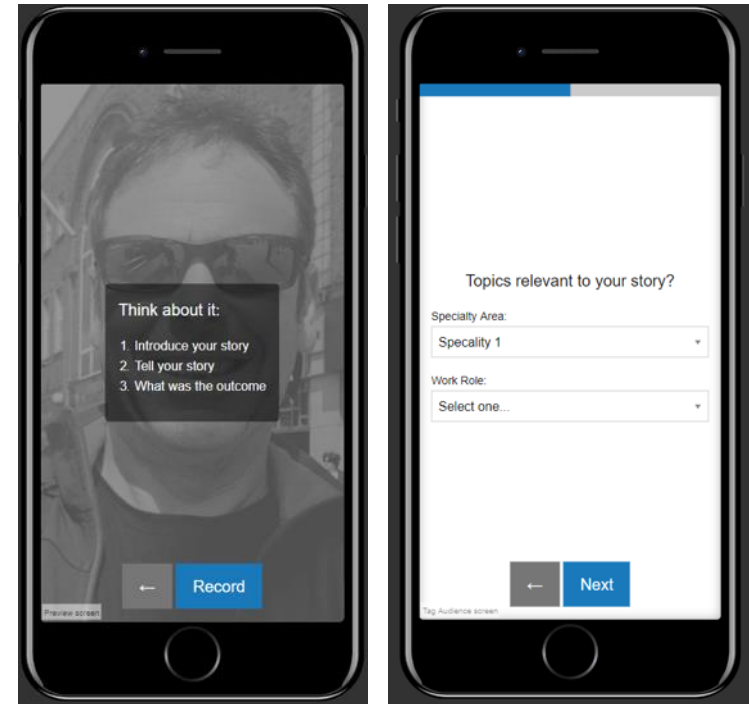
Index	Example Question
<b>BC:</b> Background & Context	What vulnerabilities will attackers try to exploit?
<b>IW:</b> Indicators & Warnings	What indicators of an attack do you look for in the network traffic?
<b>RM:</b> Response Measures	What steps do you take once an attack has been detected?
<b>ACOA:</b> Alternative Courses of Action	How can <i>least privilege</i> & <i>need-to-know</i> enhance a security policy?
<b>TT:</b> Tips & Techniques	How does pattern recognition help detect cyber anomalies?
<b>EX:</b> Examples	Has poor team collaboration ever resulted in a negative outcome?
<b>C:</b> Consequences	What are the vulnerabilities created by damage from an attack?
<b>LL:</b> Lessons Learned	What cyber risks are emerging along with the Internet of Things?
<b>O:</b> Opportunities	Are there ways of detecting insider threats before they attack?



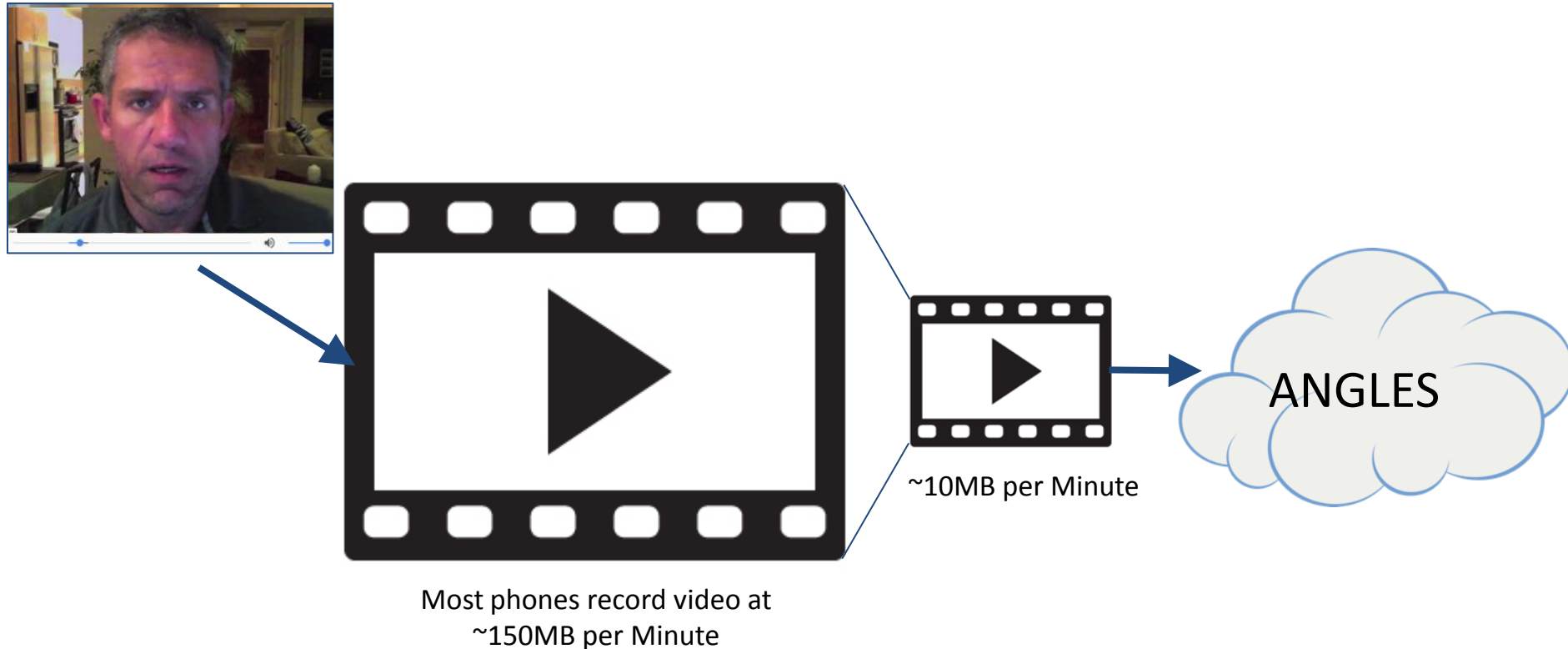


# Story Collection

- Video Capture, Compression
- Speech-to-Text
- User Selected Indexing
- Metadata Generation
- Automated Alignment

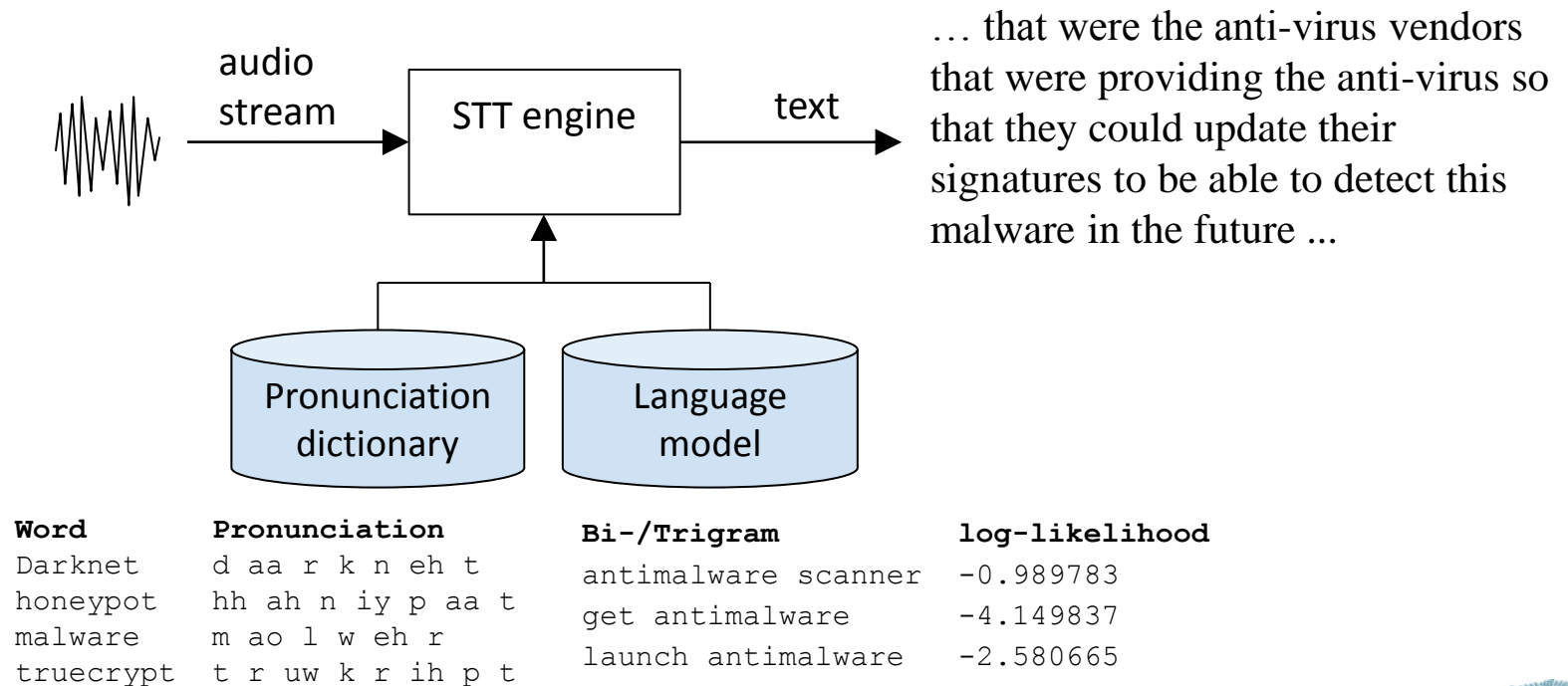


# Video Capture / Compression



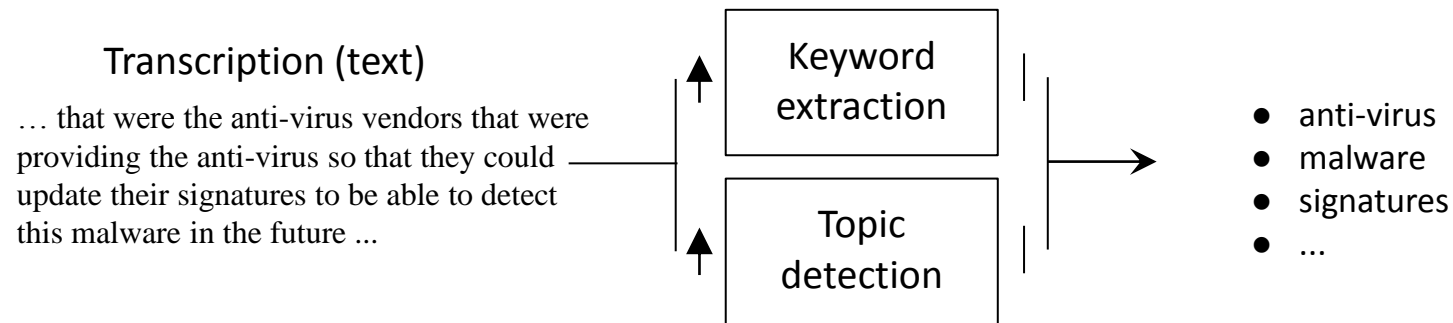
On Device Compression

# Speech-to-Text

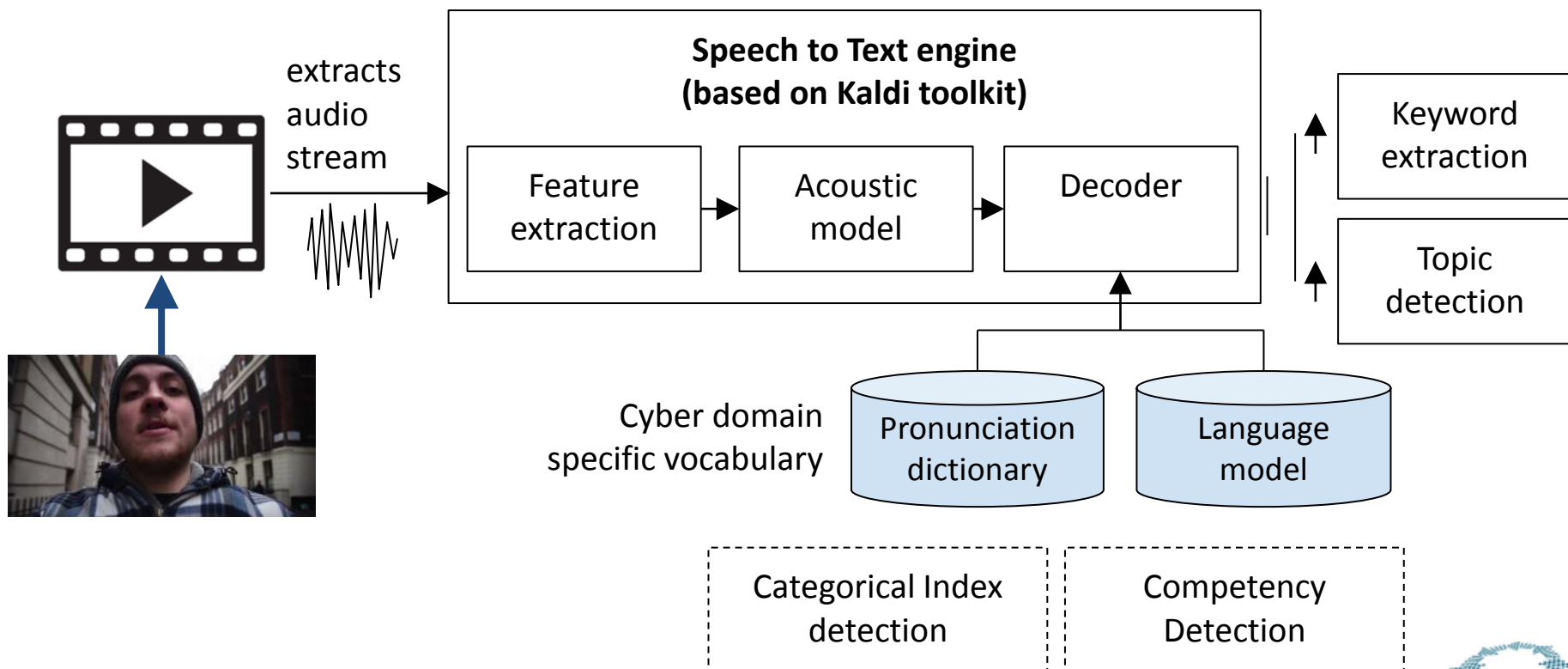


# Metadata Generation

- Proof-of-concept for keyword extraction incorporated into collection app



# Server-based Speech-to-Text & Automated Metadata Generation



**ITEC**

15-17 May 2018<sub>12</sub>

Stuttgart, Germany

# User Selected Metadata Tagging

7:39 PM

Add keywords for your story.

Add

attack employees password

privileges victims call claim

security desk

Add topics for your story.

Add Clear

Next

- Keyword suggestions from domain-tailored speech-to-text
- User-provided tagging:

11:49:00

Additional Information

Title:  
Please provide a title for this story.

Description:  
Please fill out the description.

Method of Storytelling:  
Select one...

Security Classification:  
Select one...

Type of information:  
Select one...

Lesson:  
Select one...

Level of Complexity:  
Select one...

Tag Audience screen

1:33:00

Select one...

None

Unclassified

Controlled Unclassified

Statement A

Statement B

Statement C

Statement D

Statement E

Statement F

# Automated Alignment to Questions

- Ontological expansion
- Topic detection
- Deep and shallow learning techniques

## Transcribed Text

...once the client was aware of this problem um that this problem was a real problem for them that needed to be addressed things moved very swiftly perhaps within hours my team had been deployed and we were doing analysis regarding the malwares it might be available over the next two weeks and months additional analysis relating to the chronology how widespread was the problem um how the network had been infiltrated um what were the points of egress in the network by which stolen information was being exfiltrated back to the perpetrator...

...we left some of that malware in place so as not to alert the operator that we have as much knowledge as we did regarding what they were doing we wanted to analyze its behavior to understand its behavior and to be able to craft more effective long term defence...

Probabilistic alignment  
using ontological  
expansion, topic  
detection, and deep  
and shallow learning  
techniques

## List of Questions

- ☐ What resources are available to monitor cybersecurity systems and train users?
- ☐ For a cybersecurity data collection project, what is necessary for the project to be successful?
- ☐ Once a cybersecurity problem is detected, what initial and longer-term steps can be taken to address the problem?
- ☐ What are the roles of a cybersecurity professional team



# Automated Alignment to Competencies

## Transcribed Text

...so the first thing that I will do is look at the open cases so I'll take that data I'll review what the attack activity is I'll apply that to the cyber kill chain for security I'll use a variety of tools and knowledge as a security analyst to do this then I'll be able to cross-pollinate with other teams in the organization when I've made a decision on the threat type and how it is propagated then next I'll very quickly update the operations team and what is happening and how we might use that data to create an incidence response methodology and more importantly how we can remediate the threat...

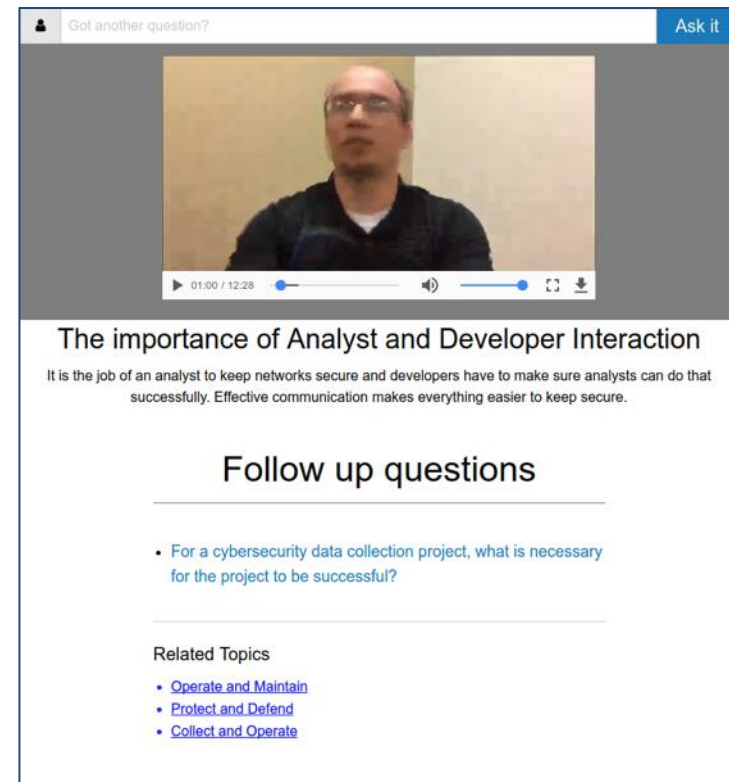
Probabilistic alignment  
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## Competency Framework

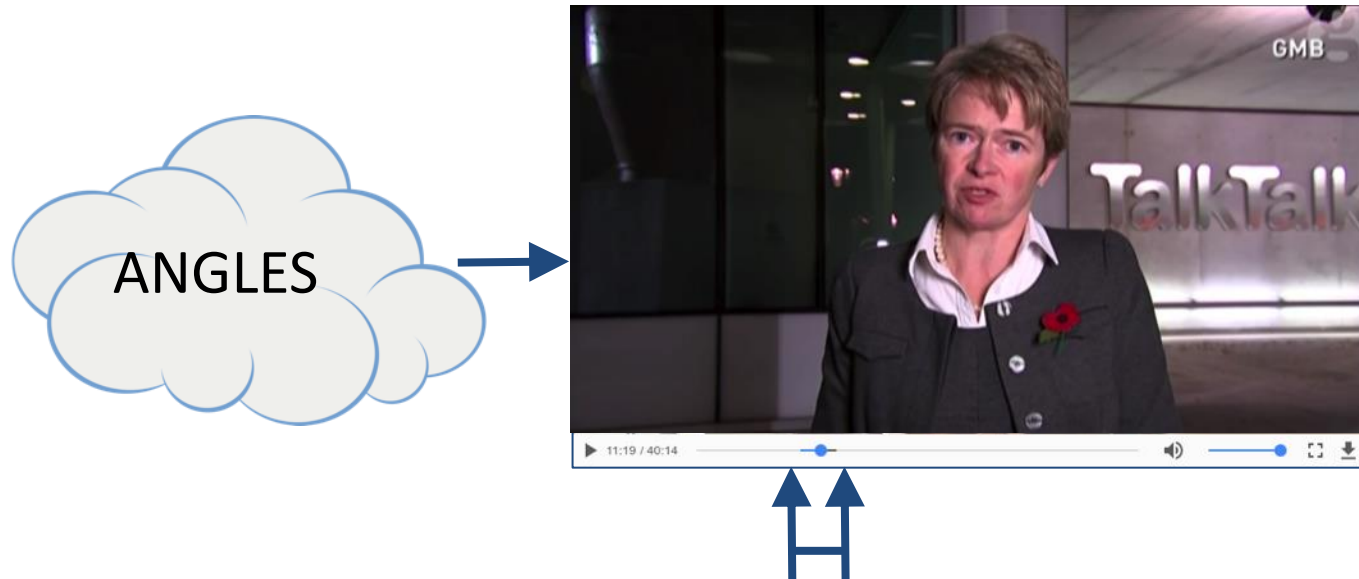
T0174	Perform needs analysis to determine opportunities for new and improved business process solutions.
T0175	Perform real-time cyber defense incident handling (e.g., forensic collections, intrusion correlation and tracking, threat analysis, and direct system remediation) tasks to support deployable Incident Response Teams (IRTs).
T0176	Perform secure programming and identify potential flaws in codes to mitigate vulnerabilities.

# Example Client Learning App

- Surrogate Simulation Environment
  - Story Browser
  - Uses API to ANGLES server
- User can
  - Ask Questions
  - Browse Topics
  - Traverse links for virtual conversation

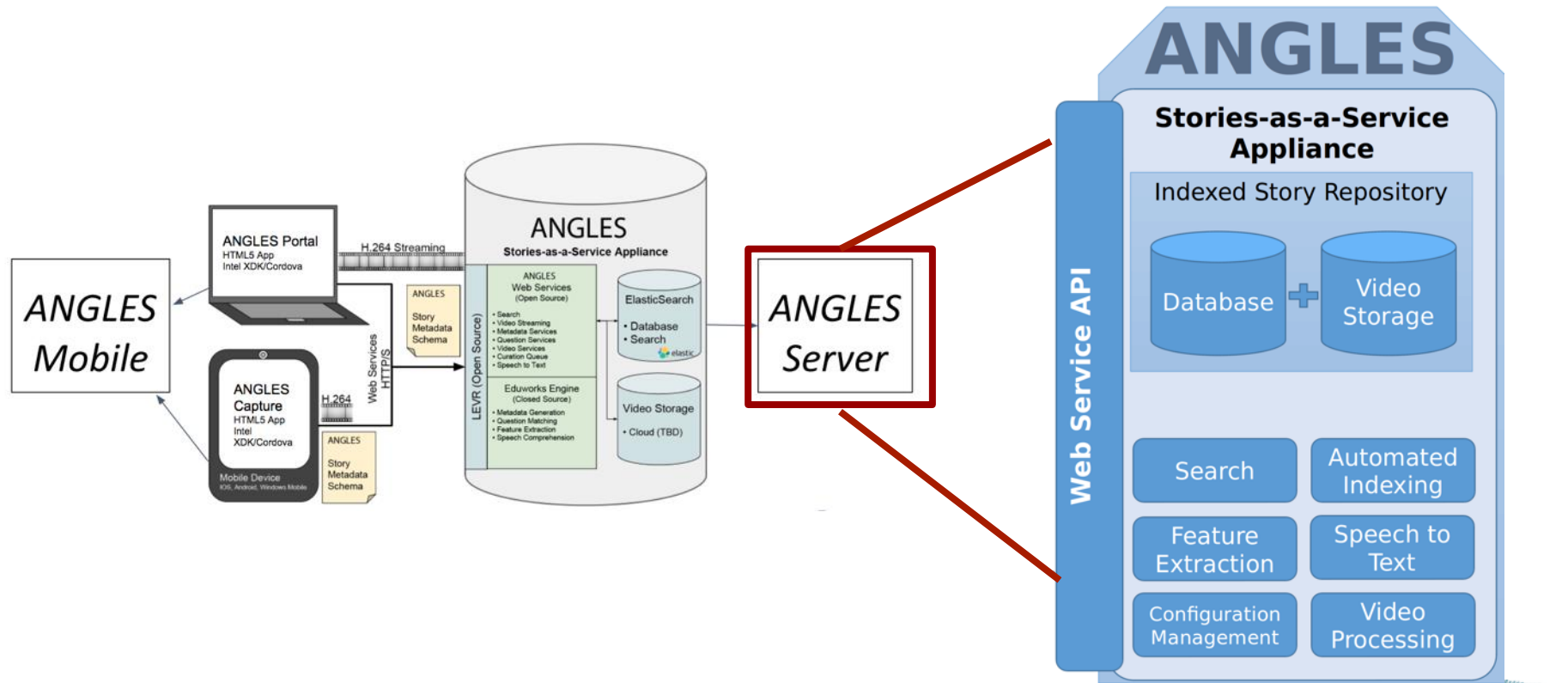


# Streaming Playback



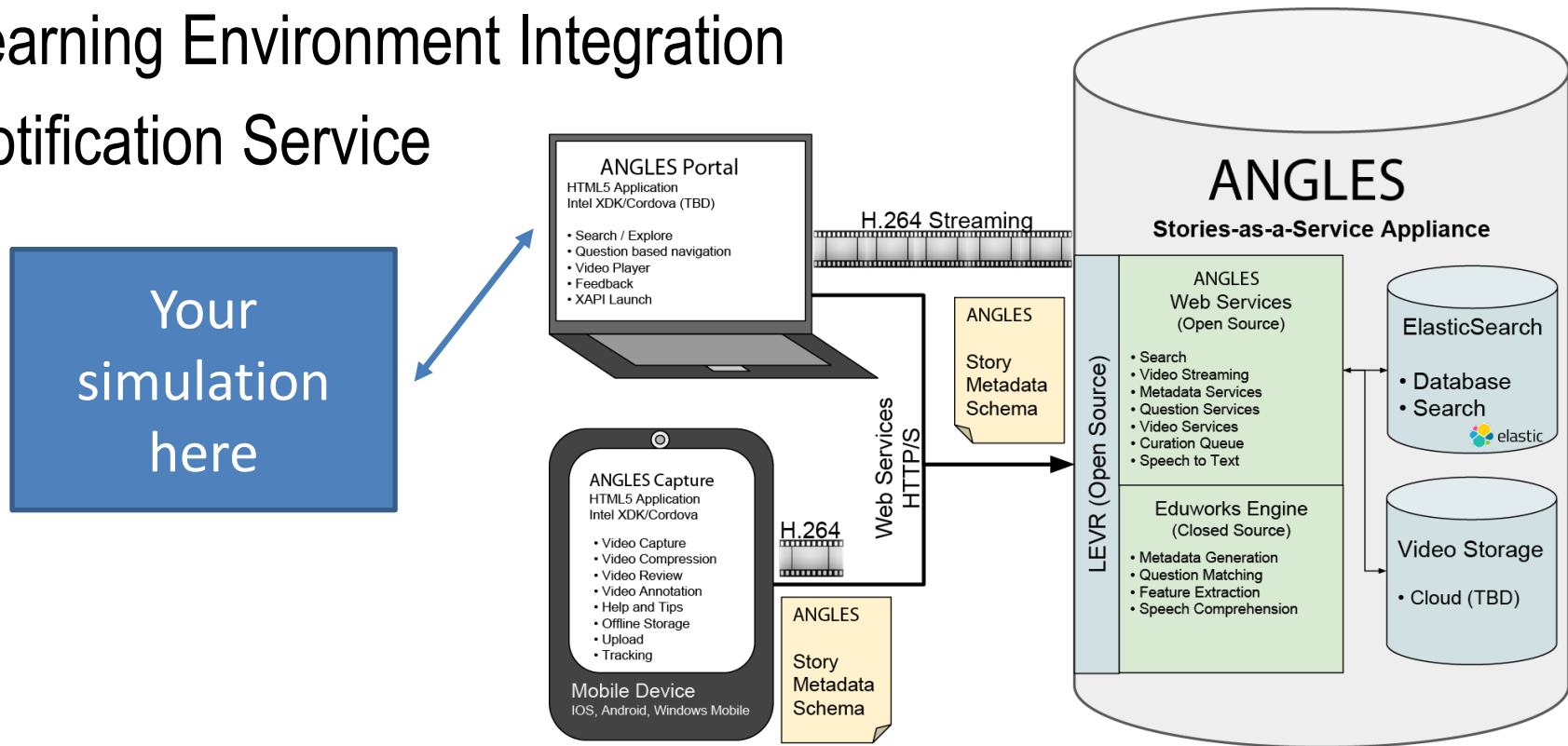
Streaming Playback enables reuse of videos for multiple stories (or other purposes)

# Architecture: Server, Mobile Client

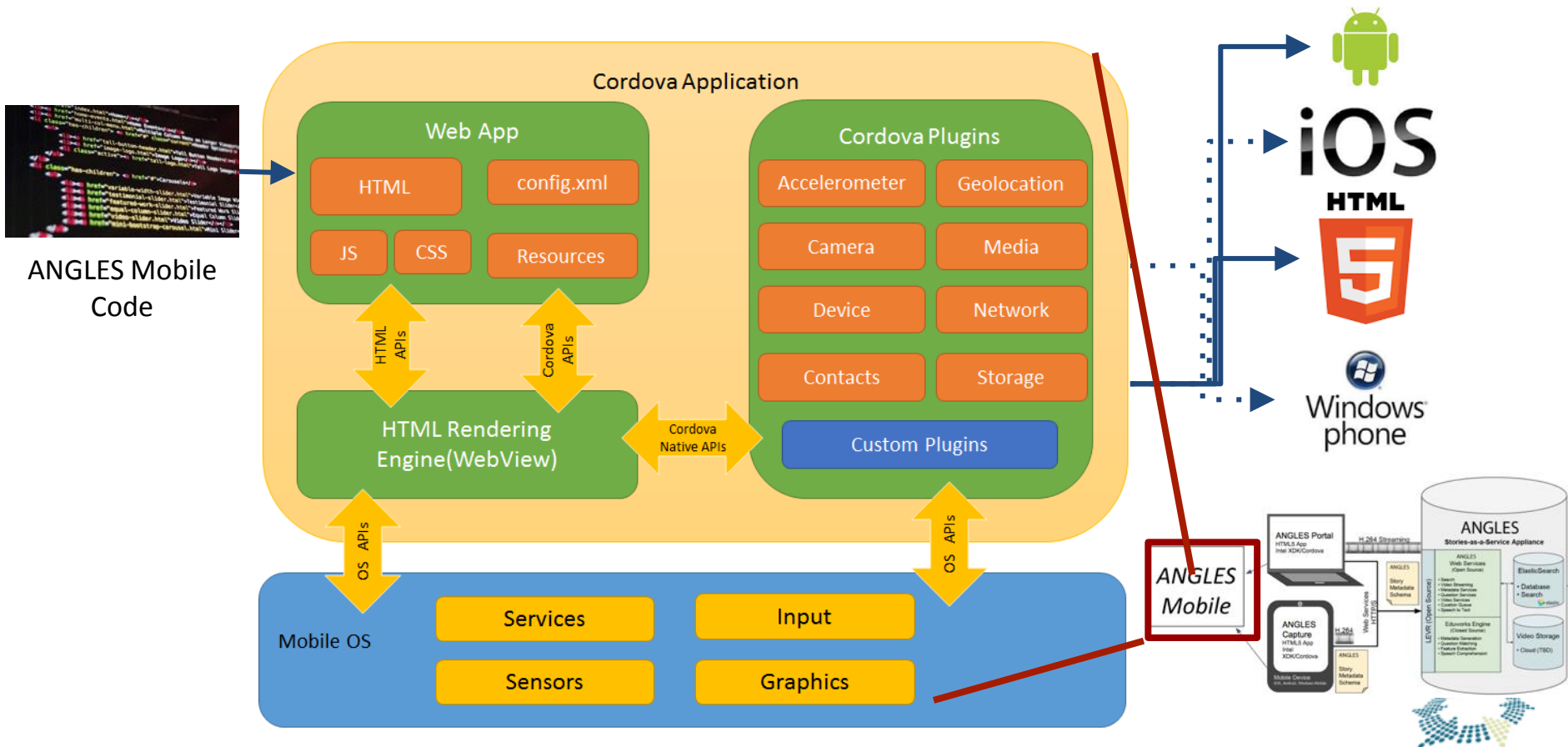


# API

- Based on Open Linked Data
- Reuses/extends common schemas
- RESTful, JSON-LD
- Learning Environment Integration
- Notification Service



# Mobile Client



# Example App: Cyber Security

- Sample stories told by cyber security SMEs
  - machine-transcribed for semantic analysis
- Tagged w/ANGLES indexing
  - 66 Stories
  - 148 Questions
  - 246 Relations (between stories and questions)





# Contributions

- Tools for Content Collection
  - Keyword recommendations to support user-tagging
- Advances in Automated Tagging of Content
  - Metadata generation / Question generation
- SOA capabilities for delivering content to 3<sup>rd</sup>-party learning environments
- Broadening Community of Content Providers

# Benefits to Armed Forces

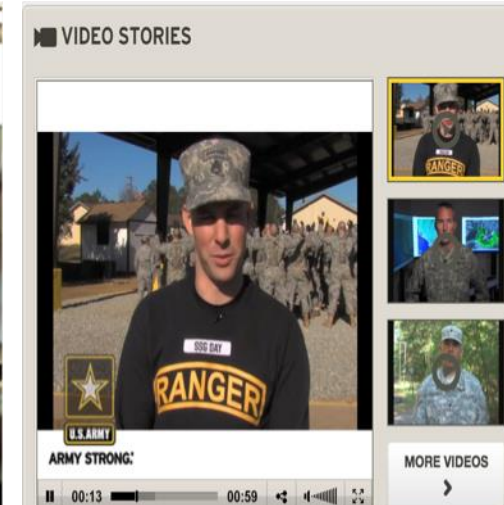
- Enhanced services/tools
  - can add scale and utility
- Used for training, recruiting, public affairs



Airman Video Contest,  
AFBlueTube



#AskASailor, America's Navy  
Youtube Channel



armystrongstories.com

# Benefits: Enhance Current Video Services

- How can ANGLES help?
  - Story collection via mobile app
  - Enhanced story navigation/browsing
  - Automated content analysis/tagging
- “War stories” -- on-demand relevant expertise
  - Interagency disaster response: Supplemental training
  - Public Health education – overdose reversal, vaccines, infant and pre-natal care, substance abuse, STDs
  - Public Safety education - driving, fire prevention, gun safety, emergency preparedness



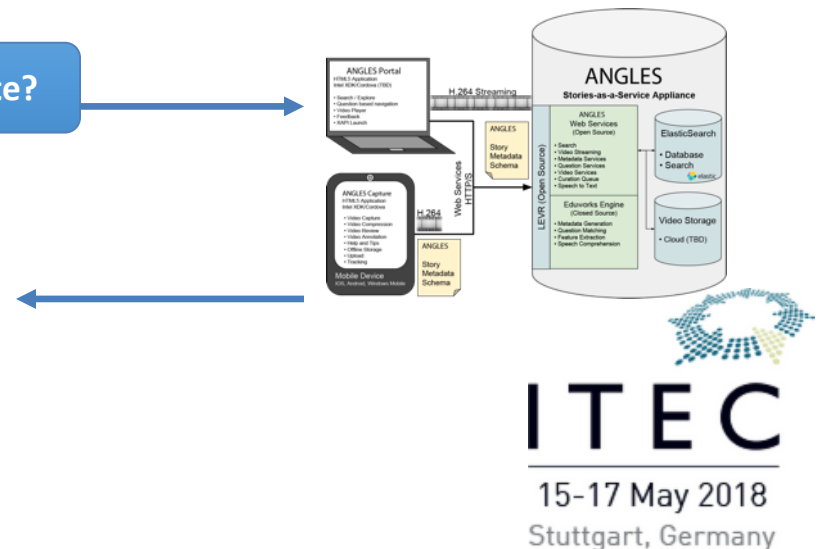
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# Applications: Private Sector

- Stories-as-a-Service
  - Integrated w/web-based eLearning, mobile learning
- Corporate Workforce Development
  - On-demand access to relevant, first-person narratives
  - Supplement formal online training and education
  - Compliance, retention

How do I know what to wear to a job site?



# Summary

- Enhances online learning w/Stories on-demand
  - SOA for delivering content to learning environments
- Broadens community of content providers
  - Videos scalable; no professional cameras, production
- Tools for content collection
  - Keyword recommendations to support user-tagging
  - Automated metadata generation / question generation
  - Content can serve multiple learning goals & apps
- API exposes Story Services to diverse simulations