Video Quality in Public Safety Workshop Summary

February 2010 Workshop
Boulder, Co

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1.0 Workshop Overview

The Video Quality in Public Safety (VQiPS) Working Group convened from February 1-3, 2010, in Boulder, Colorado, for its third workshop. The purpose of the meeting was to engage new stakeholders and advance the following initiatives:

- Development of a VQiPS Guide.
- Compilation of an inventory of existing standards and specifications for video system components that impact video quality.
- Development of a glossary of important video terms.
- Development of a set of application-independent usage scenarios (usage scenarios consist of reader responses to a questionnaire identifying the characteristics of the intended application including Usage Timeframe, Discrimination Level, Target Size, Motion, and Lighting Level).
- Development of a common library of test clips that represent the use cases that are defined by each reader's response to the following two questions:
    1. What is in the scene of interest, or scene content?
    2. What is the desired task to be accomplished from viewing that scene?

The purpose and outcomes for the February workshop were as follows:

Purpose: To baseline new and existing participants' understanding of the VQiPS project, share subgroup progress, collaborate on subgroup activities, recommend refinements to the VQiPS Guide, discuss comments on the guide from the public comment period, and identify next steps.

Outcomes:
- A baseline understanding of the VQiPS project, among participants.
    - Regarding VQiPS:
        - New and existing practitioners will understand the purpose of the VQIPs project and any final deliverables.
    - Regarding the VQiPS Guide:
        - Practitioners will understand the need to conduct usability testing.
        - Participants will discuss recommendations from the public comment period and the workshop.
    - Regarding Subgroup Activities:
        - Participants will develop a shared understanding of the subgroups' progress since the last workshop.
        - Participants will discuss completion of "must have" action items.
        - Participants will identify the project's next steps, along with target dates.

2.0 Summary of Key Insights and Clarifications

The third workshop of the VQiPS Working Group followed the release and distribution of an initial draft of the VQiPS Guide. Discussing the draft guide was an important part of the meeting agenda, and resulted in additional insight and clarification. In brief, the participants agreed upon the following decisions:

- Participants discussed and clarified the scope of VQiPS research and determined that if the equipment or issue does not touch the video stream, then the matter is outside of the

VQiPS scope. Participants strongly supported including an appendix of "additional considerations" that would identify and acknowledge many of the critical factors related to video quality, yet fall outside of the VQiPS scope. This appendix would point users to additional resources that will assist in the procurement of video technology.

- The Working Group validated the following mission and vision:
  - o **Mission:** The Video Quality in Public Safety Working Group will research, develop, and compile the necessary information for public safety practitioners (e.g., Emergency Medical Services (EMS) personnel, firefighters, and law enforcement officers) to purchase the appropriate video technology to meet their needs.
  - o **Vision:** Public safety practitioners are empowered with the necessary tools and information to purchase and employ the right video technology for their needs.
- Participants validated the following target audience for the VQiPS Guide:
  - o The target audience for the VQiPS Guide consists of public safety practitioners, as opposed to procurement agents, IT professionals, and researchers. While the public safety practitioner's rank, technical knowledge and specific role may vary from agency to agency, meeting participants unanimously confirmed that the significant majority of users will never have purchased a video system before and will likely rely on the guide to aid in the selection process. This information holds considerable implications for the "voice" in which the guide is ultimately written.
- The CCI Federal Program Manager and technical lead clarified the goal of Volume I of the VQiPS Guide. Qualitative in nature, Volume I will serve as a framework for a conversation that will encourage the end user to communicate with the manufacturer. The current guide provides a framework to help users identify the specifications for their respective video needs. Volume II will contain quantitative detail for requirements and specifications.

3.0 Project Status Updates

In previous workshops, the VQiPS Working Group organized and tasked subgroups, which have worked independently outside of the VQiPS Workshops. These four subgroups include the User Guide, Glossary, Existing Standards Research, and Use Class. The status of the subgroups is summarized below:

- o **User Guide Subgroup**
  - Since the last workshop, this subgroup contributed to the development of a draft of Volume I of the VQiPS Guide, which was distributed to a number of public safety organizations and associations for public comment. The subgroup will continue to participate in further stages of the development of Volume I.

- o **Glossary Subgroup**
  - Since the last workshop, this subgroup completed a draft glossary for Volume I of the VQiPS Guide, which was distributed for public comment. The subgroup will continue to refine the glossary.

- o **Existing Standards Research Subgroup**
  - Since the last workshop, this subgroup identified and created an initial draft matrix of existing standards and specifications impacting the quality of the video stream. The subgroup will continue to edit the draft matrix with additional specifications and standards and conduct a gap analysis on the matrix to identify gaps in existing work. These gaps will become the focus of the Use Class Subgroup's research.

- o **Use Class Subgroup**
  - Since the last workshop, this subgroup performed research to quantitatively define the five common aspects that impact video quality (target size, lighting characteristics, scene complexity, live or real-time footage, and target recognition).
  - The goal of the quantitative research is to develop replicable measurements for the five aspects and an understanding of how each of the aspects affects the level of video quality.

- o **Consumer Digital Video Library (CDVL)**
  - Since the last workshop, the Public Safety Communications Research (PSCR) program developed a library of public safety video clips. These clips will serve as illustrations of public safety video applications and will be available for video manufacturers to use when helping the public safety community identify appropriate systems for their needs, and when designing future systems based on public safety needs. In early Spring 2010, PSCR published the video clips library, which can be viewed at http://www.pscr.gov/projects/video_quality/cdvl/cdvl.php.

4.0 VQiPS Guide Discussion and Upgrades to Volume I of the VQiPS Guide

The VQiPS Working Group dedicated the bulk of the two-day workshop to reviewing and discussing feedback from the public comment period and creating recommendations for refinements to Volume I of the VQiPS Guide. Discussions involved: formatting issues, digital vs. analog considerations, guide content, guide comments, and guide upgrades.

Image 1. Participants walk through guide usability assessment

Formatting Issues

Feedback reflected concern about the length of the current document. To remedy this, the Working Group proposed the following solutions:
- Strengthen the executive summary to allow readers to quickly determine if the guide contains the information they seek.

- Convert the guide into an online tool. Volume I will be high-level and qualitative, and will provide links to Volume II with more technically complex information, specifications, and standards. This allows the reader to choose the degree of technicality, and shortens the length of the document. Ideally, the online volume would contain still images and video examples of use cases along with the related specifications and standards helpful in the procurement process.
- Divide the guide into sections for various members of the audience. For example, a section that is specific to the needs of an IT audience may not be pertinent or even necessary for other readers.

Digital vs. Analog Consideration

The Working Group debated whether the VQiPS Guide should include digital video or analog video, or whether it should represent both technologies.

- Feedback questioned whether the guide should focus exclusively on digital video. One attendee favored this approach because explaining analog video would require a far more complex document.
- Alternatively, the draft document contained several references to analog video because some people prefer that technology. One attendee said that of the 575 videos he processed last year, 60 percent were analog.
- Moreover, there were some questions regarding video system buying habits.
  - Most current video systems that are sold are digital. However, many legacy systems used today are analog. While it makes sense to include certain pieces of analog technology in the document, others are out of scope.

Guide Content

During the workshop, the VQiPS Working Group clarified descriptions of Volumes I and II of the guide, which resulted in a shared understanding of the purpose of each volume. The current guide is not intended to be a comprehensive discussion of video. Volume I will provide the framework to help end users communicate their needs to the manufacturer. Volume II will add an additional component by pointing the audience to the quantitative specifications that are necessary to achieve the desired level of video quality. The guide will function as a living document and will evolve to reflect new research. The VQiPS project is also funding work on the Consumer Digital Video Library (CDVL). The CDVL is a digital video library for researchers and developers in the fields of video process and visual quality (objective and subjective assessment). More information can be found at http://www.cdvl.org/.

Guide Comments

The VQiPS Working Group discussed general comments on the guide. When public safety practitioners begin considering purchasing camera systems, it is essential that they are armed with a mission statement clearly outlining user expectations for each camera. The VQiPS Guide should include these mission statements.
- The end users want cameras that capture every level of detail at once, from broad footage of an incident to close, detailed shots.

- Unfortunately, if a camera is set up to capture all these levels of detail at once, it creates a high-reflection situation. Cameras are optimized for specific, varied uses.

Guide Upgrades

The VQiPS Working Group made the following recommendations to enhance the VQiPS Guide:

- The guide needs to include a wider variety of public safety examples.
- The guide should include more photo examples with sidebar explanations, providing a narrative to the pictures and explaining very specifically how that particular scenario fits into the VQiPS framework.
- The guide does not hit on a system theme. The distinction between the video content and the video system may be useful to the reader.
  - There is tension between content that is too technical and content that is too basic. The VQiPS Guide needs to strike the right balance between the two.
  - All of the video system components must be well matched or the end user will not receive the right equipment to produce the necessary level of video quality.

5.0 VQiPS Guide's Target Audience

Image 2. Participants review practitioner images

Likely Target Audience

Participants responded to the question, "Who will be the most likely person to use the VQiPS Guide?" The following reflects the participants' general thoughts and comments on the subject of the guide's likely audience.

Target Audience: Public Safety Practitioners
- From a law enforcement standpoint, it is difficult to say who exactly will be tasked with procuring the video system because it depends on the organization's size; the task could fall to the lowest- or highest-ranking member of the department.
- The following response was received from a participant: "From an EMS perspective, the fire chief is going to be told to incorporate video into normal operations. In this situation, the fire chief will assign a practitioner in an administrative role to read the guide." This response demonstrates that public safety administrative members would be a part of the target audience.

- The reader could also be someone who implements compliance, such as an administrative officer, compliance officer, IT technical advisor, or training officer.
- The guide is likely to be used by public safety practitioners with practical video knowledge but no technical knowledge, IT professionals with some video knowledge, project managers, and procurement officers.

Number of Audiences

From the target audience discussion, a new conversation evolved regarding whether the VQiPS Guide should be written for more than one audience. The following is a general response summarizing the participants' comments.

- When purchasing a video system, all three potential audiences are part of the decision-making process. Executives need a strategic view to understand how to use the video system and justify the money for purchasing a system; the practitioner has to select the system and apply it; and the procurement officer has to bid on the system. The guide needs to contain fundamental knowledge that applies to all three. While this does not necessarily require separate sections, employing features such as tech notes in sidebars could be used to communicate more technical subject matter to IT readers.

Level of Technical Specificity

After agreeing that public safety practitioners are the target audience of the VQiPS Guide, the participants progressed to the question, "With this audience in mind, what level of technical specificity would be needed in the guide?" The participants pointed out that the level of technical specificity depends on the readers' technical knowledge and understanding of video technology. The participants provided the following responses:

- The general assumption is that the reader is not a video technology expert. While the reader may have some understanding as an electronics consumer, it is not assumed that he or she has a specific grasp on how a video system works.
- The guide should be written for those who need it most, which could be the small-town public safety agency that does not have the same access to assistance that a large metropolitan public safety agency would.
- The fire chief, EMS chief, and police chief know the level of video quality that is required to accomplish the mission. The guide provides the necessary language that the public safety community needs to effectively communicate their requirements to a procurement officer or vendor.
- The guide has been given to test readers, such as medics, who have read and understood it. However, details like aperture might be too technical for the average reader.
- Not all technical aspects of the guide need to be removed. Consumer reports, which are aimed at the layperson, explain subject matter in a simplistic way that is useful for everyday application of the product. The guide can contain technical detail; it just needs to be explained in a way that is easily understood.

Benefit of the VQiPS Guide

The following are responses received from practitioners in the discussion around the benefits of Volume I of the VQiPS Guide:

- 'The guide currently contains the appropriate amount of technical detail and information to assist a firefighter in procuring a video system.'
- 'Someone with no aptitude or interest in video systems should not buy large, expensive systems.'
  - The public safety response: 'That is not a realistic expectation.'
- 'Readers can skip familiar sections of the document. The guide should be accessible to people in the work force, but it should not be limited to this audience. The guide should be so accessible that any audience can use it effectively.'
- 'The majority of the time, the person tasked with procuring a video system (whether from a large or small public safety agency) has never bought a video system before. This will be the first and likely only time that the individual will buy a video system.'
- 'The audience is comprised of public safety practitioners, with a limited understanding of video technology, who are responsible for supporting operations in some capacity.

6.0 Subgroup Working Session Report Outs

On the second day of the workshop, participants broke into four subgroups. Each subgroup's agenda included addressing comments received during the public comment period, and identifying next steps and a work plan for accomplishing those goals after the workshop. The following is a brief summary of each subgroup's working session report-out:

Existing Standards Research Subgroup

General Comments
- The subgroup reviewed 12 comments received during the public comment period.

Action Items
- The subgroup reviewed specifications related to individual sections of the guide.

  - The subgroup broke down the work according to the following components/specifications: scene, lens configuration, image capture, processing, storage, and transport and display.

VQiPS Guide Subgroup

General Comments
- The subgroup reviewed 70 comments received during the public comment period.

Recommendations
- Edit the guide's executive summary.
- Include more public safety examples.
- Enhance the revised graphics.
- Explain what the guide is not in the scope section.
- Clarify the explanation of a video system.
- Edit the guide to address the public safety project practitioner, the IT person, and the division chief who are tasked with procurement.
- Establish an improved method for gathering feedback on the guide.
- Request the other subgroups' review of the technical comments, along with their revisions of sections 3, 4, and 5.
- Add specifications into the guide and distill them into samples.

- Identify the difference between Volume I and II.
- Identify pilot participants and create a pilot plan for Volume I.

Image 3. Technical lead discusses guide with participants

Use Class Subgroup

General Comments
- The subgroup discussed the necessity of mathematically defining the relationship between target size and motion, and matching that with a discrimination level in the VQiPS Guide.

Recommendations
- Establish specific, measurable definitions for small and large targets (i.e., define parameters).
- Include more public safety use case examples.
- Create test plans based on previous video quality, get the test plan approved, and collect video clips to run tests.
- Identify an editor for the guide.
- Obtain video footage examples from schools, prisons, hospitals, transportation, or highways.
- Request sample video footage.

Glossary Subgroup

General Comments
- The Glossary Subgroup doubled in size since the last workshop.
- During the working session, the Glossary Subgroup went through nine of the 11 pages of glossary terms within the VQiPS Guide.

Problems Identified
- There is a need to address comments received, including:
    - The charge-coupled device (CCD) sensor does not list the complementary metal–oxide–semiconductor (CMOS). High Definition (HD), mega pixel, and horizontal resolution are needed for camera specifications.
    - The glossary contained many largely obsolete technical terms that were out of sync with the rest of the document's content.

- Document definitions and glossary definitions do not match.
- Terms appear in the VQiPS Guide that do not appear in the glossary.
- Many terms in the glossary are too technical or would not be of interest to the target audience.
- Section 4 needs work. Because the section is full of definitions, the Glossary Subgroup should lead this effort.

Action Items
- The subgroup plans to continue working on Section 4 of the Guide, which was an existing focus area for the subgroup.
- The Guide Subgroup had two goals:
  - Use consistent terms throughout the document
  - Remove unnecessary terms from the glossary.

Recommendations
- Ensure that if a term has been used, that it is used consistently throughout the document.
- Define all acronyms in the document.
- Remove terms that are analog, too technical, or rarely used.
- Add terms that are in the document and define them later.
- Add acronyms to the glossary.

Needed From the Other Subgroups
- Provide all terms to the Glossary Subgroup for inclusion in the glossary.
- Appoint a glossary "watch dog" for each group to watch for new terms and submit new terms to the Glossary Subgroup.
- When adding definitions, cite the source where definitions were obtained (e.g., SWGIT/SWGDE Glossary).
- Consider adding terms that are relevant to each public safety discipline (e.g., fire, medical, EMS, law enforcement) and send to the Glossary Subgroup for consideration.

7.0 Overarching Issues

Workshop participants addressed the overarching issues below. Many of the participant responses were questions, some of which were answered by the VQiPS leadership.

- Is there a need for different volumes of the VQiPS Guide tailored to different audiences?
- What is Volume I?
- What is Volume II?
- Is the guide a living document?
  - Response from Federal Program Manager: Yes, to the extent to which there is funding to maintain and update the guide, VQiPS plans to do so.
- What about commercial off-the-shelf (COTS) video systems? The guide does not currently address them, and the availability of these systems seems like a pretty significant factor in the public safety video system decision.
  - Response from Technical Lead: This guide neither endorses nor ignores COTS systems, it simply helps users identify their needs and match systems to those needs (COTS or otherwise).
- Who is the publisher?

- o Response from Federal Program Manager: The document will be posted on the DHS SAFECOM Web site once it is completed.
- Who will take long-term ownership of the document and its sections?
  - o Response: A main editor or author needs to be identified.

8.0 Burning Issues Discussion

The following is a discussion of burning issues regarding the VQiPS Guide.

Image 4. Federal program manager discusses guide with participants

1. What is the timeframe for publishing Volume I of the VQiPS Guide?
   - Response from Federal Program Manager: The guide will be published in July 2010.

2. What is the strategy for completing recommended edits to meet the publishing deadline?
   - The group needs to appoint an editor to collaborate with the program manager and technical lead in considering recommended edits from workshop participants.

3. What is the process for finalizing the work that has already been completed, but is not contained in Volume I?
   - Many people have contributed their expertise to the guide. While the current volume of the VQiPS Guide may not contain all contributions, all have been saved and could be included in later volumes.

4. Does the VQiPS Guide need to be re-named?
   - Suggestion: Video Quality in Public Safety Design Reference.
   - The former "User Guide" title sets up expectations that the document will read like an operating manual.
   - Suggestions for upgrading the guide's title can be contributed to a conversation string on the VQiPS Working Group Wiki site, or can be e-mailed to VQiPS_Working_Group@sra.com.

9.0 Next Steps

The next steps to complete Volume I of the VQiPS Guide are as follows:

1. Test the guide's usability with public safety practitioners in different disciplines.
2. Perform research to quantify the scene aspects.
3. Identify existing specifications and standards that fit into the initial draft of the existing standards matrix.
4. Perform a gap analysis on the draft of the existing standards matrix.
5. Focus use class research on filling in the gaps for the network (e.g., processing and transport) sections of existing standards matrix.

Thank you to those who participated in the VQiPS Workshop, and provided recommendations regarding the VQiPS Guide and the overall direction of the VQiPS project. Over the coming weeks, recommendations received at the workshop will be considered and the VQiPS leadership will announce its strategy for moving forward. Participants will receive an e-mail outlining the project's next steps.

If you are interested in participating in VQiPS meetings or contributing to this work, please contact VQIPS_Working_Group@sra.com

Appendix I: VQiPS Workshop - Agenda

February 1-3, 2010

Monday Orientation Session (11:30 - 12:30 MST)

11:30 AM **Welcome, Purpose and Desired Outcomes, Introductions**

VQiPS Project Strategic Overview

VQiPS Project Tactical Overview

Outcome: Baselining for new participants on the general history and status of the project

12:30 PM **Workshop Guiding Principles, role for new participants**

Outcome: Clear expectations regarding successful participation by new participants

Monday Working Session (1:00 - 5:30 MST)

1:00 PM **Welcome, Opening Remarks**

Introductions, Purpose & Desired outcomes, Guiding Principles

Outcome: Baselining of expectations for the workshop

Project Status Update

Subgroup Status Updates

Outcome: Baselining of specific project history and status

Review of the Video Quality Guide Format and Steps

Outcome: Baseline familiarity of the draft Procurement Guide and the process it recommends

Break

Still Image Classification Exercise

Outcome: Clarity regarding generalized use case classification

Homework Review

5:30 PM **Wrap Up**

6:00 PM   **Participant Happy Hour/ Dinner**

Tuesday Working Session (9:00 - 4:45 MST)

9:00   AM   **Review & reflection; introduction of new participants; agenda review**

Outcome: Insight into what impacted participants on Day One; integration of new participants; expectation setting for Day Two

Guide "Usability" Assessment

Outcome: Recommendations for improving the clarity and usefulness of the guide

The Video Quality Guide comments review

Outcome: Shared awareness of comments received during review period; distribution of comments to appropriate subgroup for consideration

Subgroup work sessions

Outcome: Progress on subgroup action items

12:30   PM   **Networking lunch**

Subgroup work sessions

Outcome: Continued progress on subgroup action item

Subgroup work sessions report out

Outcome: Shared awareness of progress, dependencies, gaps and next steps between and among subgroups

Overarching issues discussion

Outcome: Recommendations for addressing overarching comments resulting from the review period

4:45 PM   **Wrap Up**

Wednesday Working Session (9:00 - 12:00 MST)

9:00   AM   **Review and Reflection**

Burning Issues Discussions

Outcome: Resolution of any outstanding issues not included in the agenda

Existing standards matrix validation and upgrade

Outcome: Recommendations for critical standards, existing or needed, to augment the guide

Break

The Road Ahead

Outcome: Define parameters for next steps on the project, identify gaps, and identify resources to fill gaps.

Next steps and commitments

Outcome: Identification of action items, owners, timeframes, and individual commitments to advance project goals

12:00   PM   **Closing comments and adjourn**

Appendix II: VQiPS Information

Additional information can be found for the VQiPS project on the SAFECOM Web site at the following link:

http://www.safecomprogram.gov/SAFECOM/currentprojects/videoquality/