No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
268	1	2	ES	2	Should be "Threats" vice "Threat"	Change made as recommended.
269	1	2	ES	8	Change"… so throwing more technologies at the problem can cause more harm than good" to read "… so just adding individual technologies can cause more harm than good."	Change made as recommended.
270	1	2	ES	9	Change "seamless" to "integrated"	Change made as recommended.
271	1	2	ES	12	Change "on the horizon" to "underway"	Change made as recommended.
1	1	2		7	Clarify "throwing technologies can cause more harm than good" - sometimes more tech is okay	Changed text to read "…home safely. To avoid overwhelming Responders with too many devices or excessive amounts of data, responders need…"
2	1	2		12	FirstNet is NOT on the horizon - it is here	Deleted the text "…on the horizon."
272	1	3	ES	21	Change ..do not necessarily have technical knowledge" to "…do not need the in-depth technical explanation of the systems."	Change made as recommended.
273	1	3	ES	25	Add "as supporting information" to "…full list of NGFR Apex program requirements - "	Change made as recommended.
3	1	3		15	FirstNet should be listed here	Added reference to NGFR's cooperation with FirstNet.
4	1	4		9	How can you publish this guide without significant consultation with the First Responder Network Authority and AT&T	No change indicated or made. NGFR currently working with FirstNet / AT&T to obtain their input.
274	1	6	I	23	Replace " …physically guard them against hazards in the workplace." to "… physically shield them from hazards in the workplace."	Change made as recommended.
275	1	7	I	I	Change"… so throwing more technologies at the problem can cause more harm than good" to read "… so just adding individual technologies can cause more harm than good."	Change made as recommended.
276	1	7	II.A	33	Add a new paragraph after line 33: Because the data transmitted by the SmartHub system is of little value until it is delivered to someone for review and/or action, the Handbook also provides general guidance as to how SmartHub systems can be interfaced with agency CAD, GIS, and situational awareness systems. Data format compatibility and system interfaces are crucial to the efficient exchange of information among the various "back office" systems that may be used by an agency. The interface information can also inform agencies as to how to transfer data among multiple agencies and systems."	Change made as recommended.
277	1	8	I.B	7	Add "as supporting information" to "…full list of NGFR Apex program requirements - "	Change made as recommended.
94	1	8		35	Weight/dimensions/ergonomics guidance?	No change made. We don't plan to be that specific. Innovation, technology advances, user input, etc. will dictate what the form factor will be.
278	1	9	II.A.1	19	Delete all references to IAN throughout the document (all three parts) and only refer to the WAN.	No change made. The Incident Area Network remains a viable concept.
95	1	9		1	• Line 1: Power Module- Long-Term power to all devices : Doesn't make sense if sensor has 1 year battery life • Line 1: Is the controller module providing power for I/O and sensor modules, since there's no connection? Should show data and power • Line 1: Why isn't a keyboard/touchscreen considered an I/O? Push to Talk • Line 1: What if there's multiple Communication Modules (i.e. cellular and then SatCom)?	Changed graphic to indicate: "Long Term Power to all Wired Devices". Because separate I/O devices are usually wireless, no power is provided to them. Added "Touchscreen" to I/O list NGFR expects that responders may have multiple communications infrastructures over which they can communicate, therefore multiple communications devices connected to a communications module.
96	1	9		8	What about repairing with new device?	Changed text to indicate module replacement requiring possibly "…only minor configuration changes."
97	1	9		11	• Line 11: 30 minutes would not last very long, and doesn't make sense for sensor modules • Line 11: 30 minutes is very nebulous. What is the expected duty cycle?	Reworded to indicate "Wired modules". The 30 minutes for wired modules is so that they can retain readings, configurations, etc. while the power module is swapped out. The duty cycle for the power module was edited to note that it should last a 12-hour shift.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
98	1	9		19	What about WAN LTE? That makes more sense than an optional local IAN communications	No change made. The Incident Area Network remains a viable concept.
99	1	9		22	Location would be part of Comms Module more than controller	No change made. Most comms modules do not have location capability, almost all modern smartphones (acting as controllers) have location sensors. Location can also be provided by an external sensor.
279	1	10	II.A.1	26	Add another paragraph after Line 26 to read: "A 'lightweight' controller could also be implemented using a single-board computer (e.g., Raspberry Pi), a voice recognition application, and a location module with LMR as the wireless connection - to provide minimal functionality for agencies with limited funds, no LTE coverage, and/or a desire to conduct operations only on their own communications networks."	Change made as recommended.
15	1	10		3	add a requirement: the need to transform data received from nonvisual, non-textual, non-aural information into forms that are usable by the incident management team or other responders in making judgements about next actions. Change: add major bullet: • transform data received from nonvisual, non-textual, non-aural information into forms that are usable by the incident management team or other responders in making judgments about next actions.	No change made. Currently not dealing with non-visual, non-textual and non-aural information flows.
100	1	10		7	Mechanisms for pairing devices?	No change made. Pairing is part of managing Bluetooth connections. We did not note the need for utilities to manage any of the communications connections, they are inherent in the devices.
101	1	10		10	What about MCPTT? Very important	No change made. MCPTT = "Mission Critical Push-to-Talk" is addressed in general as part of the Comms Hub interface. We do not plan to address MCPTT any further in this version.
16	1	10		13	map display: depending on the situation, map displays can be cumbersome to mentally process or even encumber visual senses when those need to be focused on the situation and task at hand. An analysis of types of situations is needed to identify where and when a map display needs to be replaced with or augmented by displays of directional information in other ways that help the person maintain situational awareness. For example, when a person gets closer to the area where action is needed, using Doppler to orient the responder or by providing kinesthetic feedback and intensity to the side of the body closest to where the responder needs to change direction or to take an action. Where other team members need information regarding the location of the team member in question, for example, to coordinate meeting to take actions, the information may need to be transmitted to and processed by the other team members in non-visual, non-aural ways that update in ways that help the other team members keep SA and to do so in close-to-real-time so as to not providing inaccurate information that will result in miscoordination. Change: presentation of maps so the details enhance rather than interfere with situational awareness and task execution	No change made. This type of interface (e.g., Doppler) will be addressed in a future release, we are still trying to develop the basic standards for now. The first step is to deal with the alerting functionality, then we can progress to more complex user feedback mechanisms.
102	1	10		18	I would add VPN capabilities	No change made. The security section addresses these types of issues, but VPN may require too many resources to be efficient for the mobile system.
103	1	10		23	Where is the delineation between a Controller Module and a Communications module? What happens if they're integrated together, as I would assume almost all implementations would?	No change made. See "hybrid" description later in the Handbook. The functionality delivered by the Comms Hub and Controller will be an engineering decision.
104	1	10		35	Location, accuracy, elevation, for capable devices (i.e. cellular, SATCOM)	No change made. Location is considered to be a sensor output, design determines which device(s) provides location information. There may be multiple location sensors on-body, the system will then have to perform de-confliction or filter out the less-accurate location data.
105	1	10		36	Definition of connected systems? What mechanism is defined to determine?	No change made. See Line 39.
106	1	10		39	Duty cycle for 30 minutes?	Explanatory text added under "Power Module"
107	1	10		40	What if the power module isn't defined?	No change made. See Section 3. on following page

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
17	1	10		36 - 37	physiological sensors should also include kinesthetic, vestibular, haptic so that the disposition of the responder or victim(s) can be gauged. In the case of vestibular, it should transmit information about the orientation of the person relative to the ground and velocity information that will indicate if the person has taken a fall as opposed to having kneeled or sat, which would be normally expected actions. Change: add to the list of physiological sensors these: kinesthetic, vestibular, haptic	Added bullets for " kinesthetic", "vestibular" and "haptic" to Controller Module capabilities list, did not add to sensor list.
280	1	11	II.A.3	17	Change "110 volts" to "110 VAC" and "12 volts" to "12 VDC"	Change made as recommended.
108	1	11		3	Definition of business rules?	No change made. "Business rules" are the rules governing the behavior of the comms module - i.e., how it makes decisions on routing data. Lines 4 - 9 are some of the criteria used to make routing decisions.
18	1	11		15	the discussion of input/output devices seems to posit an action taken by the responder. In many cases that can increase task- and sensory-loading. Options for I/O that are sensitive to high-task load situations are needed so that data is transmitted in circumstances in which the responder's task and sensory processing are likely to be too great for the responder to engage in device I/O tasks. The list also needs to include vestibular and kinesthetic in addition to I/O for other senses. Change: add to the list of internal capabilities these bullets: • vestibular • kinesthetic	No change made. We are still developing the alerting mechanisms. What alerts are received by Responders and how they are presented will be configurable by agency.
109	1	11		17	Charger shall have the capability of 120VAC or 12VDC	Change made as recommended.
110	1	11		18	Add battery condition/health (different than charge) Add capability of reconditioning batteries (self and connected) Add statistics for consumption per device? Voltage provided, minimum current, number of connected devices supported?	No change made. Battery monitoring functionality is based upon international standards used for laptops, etc., the Smart Battery Data Specification. We do not plan to create our own specification.
111	1	11		21	Add IP/MILSPEC rating and short-circuit detection and mitigation	No change made. Battery monitoring functionality is based upon international standards used for laptops, etc., the Smart Battery Data Specification. We do not plan to create our own specification.
112	1	11		27	Batteries must be user replaceable.	Change made as recommended.
281	1	12	II.A.5	15	Here the term used is "I/O Devices", recommend be changed to "I/O Modules"	No change made. I/O Devices are within the I/O Module -- will stay as is.
282	1	12	II.B	37	Delete all references to IAN throughout the document (all three parts) and only refer to the WAN.	No change made. The Incident Area Network remains a viable concept.
113	1	12		7	What if it's just a simple contact switch, such as for firearm/non-lethal holster?	No change made. We expect all sensors to have some "intelligence" to be able to provide status, determine if the sensor has failed, etc. Simple contact switches would need some sort of management device to provide an interface to comply with sensor requirements.
114	1	12		9	Shortsighted, vest sensor as an example can go about a year. Overall recommendation is if battery life >6 months, not necessary to use power module	No change made. The 30 minutes is a minimum. Perhaps, but it is a hard minimum.
115	1	12		27	No requirements for battery duration?	Added text where applicable in Handbook to indicate that any non-hardwired module needs to have battery life of 12 hrs.
116	1	12		37	Should not be dependent upon the creation of an IAN, this is a rare occurrence	No change made. The Incident Area Network remains a viable concept.
283	1	13	FIG 2		Revise Figure 2 to remove IAN components	No change made. The Incident Area Network remains a viable concept.
117	1	13		3	What about the WANs of multiple agencies?	No change made. Our understanding is that most jurisdictions use the same WAN for all their agencies.
118	1	13		14	In most cases, information would come directly from the responder. Need to focus on the everyday use case instead of special circumstances	No change made. Law enforcement primarily communicates Responder directly to CC, Fire service primarily communicates Responder to IC to CC. Text covers both.
19	1	8 and 9		23-6	Concentrates on visual and audio when there is opportunity to incorporate haptic, vestibular, kinesthetic channels to sense, receive, and send information. Change: add bullets for these capabilities: • Haptic displays/sensors • Kinesthetic displays/sensors • Vestibular data collection capability	Added bullets for " kinesthetic", "vestibular" and "haptic" to Controller Module capabilities list

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
36	1		III		Add: Figure 3 - Sensor Module References Architectures Figure 5 - Open System Interconnection Layer Model Figure 6 - Jurisdiction Architecture Figure 7 - Nationwide View from the Geocent section of: HSHQDC-17-F-00078_SAFE_Base Year_NGFR February 2018 Integration Event Engineering Report_FINAL 20180331.docx	No change made. We will consider these for inclusion in a future edition after further discussions with the commenters.
5	1				How is the task of community based consistent identification ,adoption and implementation of new NGFR related feature sets and capabilities coordinated?	No change made. Will be done on a jurisdictional basis based on needs and resource availability. Goal is to attempt to facilitate the availability of technologies.
6	1				How are these capabilities coordinated at the community level cross agencies to ensure consistent response?	No change made. This is a jurisdictional issue, they will have to handle cross-agency technology implementation.
7	1				Where the responsibility lie for coordination of improved capabilities between multiple agencies?	No change made. Coordination will be the responsibility of local, regional and state planning bodies.
8	1				Can users override Wearable Smart Hub/Comm's Hub functionality when necessary or in times of need?	No change made. This will depend upon how the Agency has configured the devices, they will select what functionality can be overridden and what functionality is fixed.
9	1				How can agencies utilize analytics and conclusions resulting from past Smart Hub/Comms Hub performance and incorporate those heuristics into work for improved NGFR User I/O Module capabilities?	No change made. This will be between users and providers, not part of the Handbook guidance.
10	1				What examples of processes and protocol can be put into place to educate First Responder agencies as to the benefits of modular and scalable solutions and how they best suit their agencies?	No change made. This is out of scope for the Handbook, although it may be part of a future Concept of Operations document.
11	1				What Best Practices can be introduced to agencies for their internal use to promote "Protected, Connected, Fully Aware" capabilities as outlined in the NGFR handbook?	No change made. FRG plans to associate handbook compliance by manufacturers with use of grant funding to encourage procurement of handbook-compliant technologies by Agencies.
12	1				What examples of sensor integration can assist agencies in developing the best connections and solutions for their users? Can examples of Smart Hub configurations be developed as examples by discipline so agencies can understand the integration possibilities and assist them in developing solution that best fit their agency?	No change made. This is not being currently considered for inclusion in the Handbook, although it may be part of a future Concept of Operations document.
14	1				How can Communications Hub modules be interfaced with existing LMR systems for seamless PTT functionality between systems?	No change made. Comms module would control responder's LMR via "business rules" and manage the integration of the Comms Module with the existing LMR system. Control of Responder's LMR already described.
284	2	7	II	16	Replace "… Specific requirements, as identified through the Project Responder 4 initiative, are provided…" with "...The requirements from which the Handbook was developed are provided…	Text edited as recommended
285	2	7	II.A	20	Delete the words "and other rescue teams,"	Text edited as recommended
286	2	7	II.B	33	Change "…shall secure all communications." to "…shall secure all data communications."	Text edited as recommended
120	2	7		28	This presents a risk. What is considered lower priority data, and what determines it? What if the device decides the information is a lower priority than what the user, Incident Command, or Command Center thinks it should be?	No change made. Agree, it represents a risk, but priority is expected to be configurable and set by agency policy, see later in the document.
121	2	7		33	Shall secure all communications - specify FIPS 140-2 compliance	Revised handbook to indicate all data communications to be encrypted for transmission, see Line 34 (above). We will research the standards to identify the applicable one(s).
122	2	7		34	Is the configuration done remotely and/or locally?	No change made. Some configuration will be by a System Manager/Administrator, some configuration may be by the Responder/user, all based upon Agency policies.
287	2	8	Figure 2		add yellow line to "Single Band Radio"	Graphic edited as recommended.
123	2	8		1	What if multiple communications hubs? What is the protocol defined for the communications, and are the arrows between the comms hub and various sources arbitrary (e.g. SatCom can't pass Equipment sensors, single band radio can't pass equipment sensors)? That wouldn't make sense Defines on-body, what about those mounted in vehicles?	No change made. We envision only one comms hub with connections to multiple communication devices. What data is passed by which device is based upon "business rules" established in comms hub. Vehicle issues out of scope for Handbook.
124	2	8		8	Sensor data format?	No change made. We have a task force working on recommendations for data formats.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
125	2	8		20	Why will a separate power source be required? What if the comm/controller has a power source, is that acceptable?	Separate power source identified to ensure adequate battery life for an operational shift. Noted elsewhere in handbook.
126	2	8		23	Shall be capable of operations for full twelve hour shift	Text edited as recommended
20	2	8		12 thru 15	This section appears to focus on interactions the responder will make with the device. There are cases in which interaction with the device leads to task- or sensory-overload or either interferes with or distracts the responder from the situation. The interface should include options for interactions to occur between the device and other team embers/devices/databases that do not require the responder to interact. Identification of situations in which automated response interfaces are needed in lieu of responder I/O is needed so that requirements for automated I/O interfaces can be identified and realized in the solutions. Change: Replace second sentence with this one: The interface should include options for interactions to occur between the device and other team members/devices/databases that do not require the responder to interact. Identification of situations in which automated response interfaces are needed in lieu of responder I/O is needed so that requirements for automated I/O interfaces can be identified and realized in the solutions.	No change made. This will be addressed as we address the composition and functionality of alerts. Our work with the HAZMAT Team in Harris County will assist us in developing the appropriate handbook language.
21	2	8		8 thru 10	on body sensors should provide more functionality that measures and reports more activity than are listed here. As indicated in the Part 1 notes, Information about orientation of the person relative to the ground and velocity information that will indicate if the person has taken a fall as opposed to having kneeled or sat, which would be normally expected actions. Vestibular and kinesthetic information the attitude of the responder (in this case attitude meaning a position of the body proper) is paired with velocity information to report if the responder has fallen as opposed to purposefully repositioning to be closer to the surface. Change: add to the on-body sensor list on line 10 Vestibular and kinesthetic information is paired with velocity information to report if the responder has fallen as opposed to purposefully repositioning to be closer to the surface.	No change made. Measurement of orientation, etc. will depend upon the sensors. We are prescribing how the sensors transmit data, what sensors are selected will determine what data is transmitted.
288	2	9	II.C	8	Change "On-body sensors include physiological…" to "On-body sensors also include physiological …"	Text edited as recommended
289	2	9	II.D	13	Change "…such as touchscreen, …" to read "…such as touch screen or voice command, …"	Text edited as recommended
290	2	9	II.E	21	Change "…be able to interface to an…" to "… be able to recharge from an…"	Text edited as recommended
291	2	9	II.E	23	Add "…and recharging any wireless modules."" to the end of the sentence	Text edited as recommended
292	2	9	II.F		May want to revise this section for clarity and accuracy	Text edited as recommended
127	2	9		6	Capable of being regrouped into another voice group	No change made. Regrouping of radio channels is a function of the LMR "code plug", not the controller. However, depending upon the controller-LMR interface, the controller should be able to control what call group the radio is using.
128	2	9		13	Clarify what "the location" is, assume incident	Text changed to indicate "incident location"
129	2	9		14	GIS or CAD? There's a difference. Whose GIS/CAD? Who has the responsibility for compatibility?	No change made. The assumption is that the SmartHub has a GIS for map display. We cannot assume that the Responder also has a CAD client, although if they do, that would function as their GIS.
22	2	9		15	Communication of location/geospatial information on the responder's GIS display may result in interference with the task and with senses that need to be otherwise engaged in the situation. There should be the ability to identify the situation, tasks, senses that are occupied, and how the GIS information is to be used. If a visual display will increase task or sensory loading, a means for providing the information to the responder in a more usable way via the modules is needed. It may be that the situation and task require kinesthetic communication on the part of the responder's body so that the responder is guided by touch to the space where actions are needed. Change: replace the words "in responder's GIS display" with the follow: "in responder's field of perception in ways that enhance performance and do not increase sensory of task loading."	No change made. The assumption is that the SmartHub has a GIS for map display. We cannot assume that the Responder also has a CAD client, although if they do, that would function as their GIS. May want to add verbiage to reflect HIS testing to ensure minimal impact on reponder performance.
130	2	9		19	Call out page for standard	No change made. We may add an appendix to a future version with all the standards.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
131	2	9		21	Define Alert format?	No change made. We are still working on developing the data format for alerts.
132	2	9		22	Generated by who/what?	No change made. This will be addressed as we address the composition and functionality of alerts. Our work with the HAZMAT Team in Harris County will assist us in developing the appropriate handbook language.
23	2	9		25	The examples should be expanded to include kinesthetic, which is different from haptic. The provision of alerts via appropriate kinesthetic sensory information may be more appropriate that to assume that touch is needed to acquire the information. Change: in the parentheses at the end include kinesthetic	No change made. This will be addressed as we address the composition and functionality of alerts. Our work with the HAZMAT Team in Harris County will assist us in developing the appropriate handbook language.
133	2	9		30	Cable material?	No change made. We plan to refer to hardware specifications, not develop them. This may be covered by one of the numerous NFPA specifications.
134	2	9		32	Replace mini-usb with USB-C. Micro-USB isn't a good choice as it's fragile	Text edited as recommended
24	2	9		26 thru 29	Identify where information that needs to persist to immediately provide information to the responder, ICC, other responders. Does it need to be immediately available to the responder, to the ICC, and/or to other responders regardless of connectivity changes? Change: add a sentence: The capability shall include identification of which information needs to persist and where to immediately provide information to the responder, ICC, other responders.	No change made. This will be addressed as we address the composition and functionality of alerts. Our work with the HAZMAT Team in Harris County will assist us in developing the appropriate handbook language.
293	2	10	II.H	2	Change … allow users to create… " to read "… allow users or system administrators (based upon roles and permissions) to create…"	Text edited as recommended
294	2	10	II.I	7	Document states "…shall conform to a number of standard physical form factors…" but never states them. Need to reword.	Text edited as recommended
295	2	10	II.J	12	Revise entire section to provide standards or requirements. Delete references to commercial firms and their product names.	Text edited as recommended
296	2	10	II.K	27	Revise entire section to provide standards or requirements.	Text edited as recommended
135	2	10		1	Device profiles shall be maintained on network, and login into device determines downloaded profiles. Device/sensor pairing can be done by an administrator prior to user deployment, and individual devices can also be swapped/paired	Text edited to reflect that we anticipate centrally-managed profiles that maintain association with a controller ID as the unique ID for the SmartHub system.
136	2	10		7	"number of standard physical form factors" then conflicts with "final format is responsibility of the solution providers"	Reworded to increase clarity. We cannot really specify physical format of the devices.
137	2	10		10	Define ruggedness, temperature range, water/sand penetration	No change made. Applicable NFPA standards cited elsewhere in document.
138	2	10		24	Credential incompatibilities may prevent device operation	No change made. Still working on the credential solution as part of overall ICAM issues.
139	2	10		28	How are UID defined and formatted?	No change made. Part of the greater Identity, Credential and Access Management (ICAM) issue, will have to be addressed keeping in mind ICAM solutions already in place by agencies.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
25	2	10		2 thru 4 and 13 thru 18	This covers personal profile and identify management: In many cases responders will not have a grasp of their states that enable them to completely create a profile that is usable during an incident. The solution needs to make this function an interaction between databases containing responder information and the responder. Profile information that drives the device functionality should include expertise level, specialization, role in the current incident, date this responder last engaged in this role, training and recurrent training received that impact the responder's ability to engage in this situation. Information will be tailored to the responder based on this information. For example, there is a water supply contamination requiring a soil expert, and the responder who brought in was part of the team because s/he was the nearest resource. If the expert has not tested soil samples in two years, it may be important that the device provides remedial training and other resources the responder would need to perform as part of the response team. However, a soil expert who tested samples within the past few months would not require this additional information and, in fact, would be distracted by the presence of these resources. Change: Add after last sentence on line 5: Profile information that drives the device functionality should include expertise level, specialization, role in the current incident, date this responder last engaged in this role, training and recurrent training received that impact the responder's ability to engage in this situation. Information will be tailored to the responder based on this information and to tasks/decisions in which the responder will engage during the incident resolution work . A second change: Add after the sentence on line 16: It will base information exchanges on roles, expertise, and so on identified in the personal profile.	No change made. Profile will be established by agencies/jurisdictions as part of the larger ICAM solution. Most agencies already have profiles for Responders who log onto agency systems, this would just need to be extended so that the profile managed access from the on-body system and provided the configuration necessary for the on-body user.
297	2	11	II.L	10	Revise entire section to provide standards or requirements. Delete references to commercial firms and their product names.	Text edited as recommended
140	2	11		5	Is mentioning MobileIron an endorsement as MDM? Statements are not vendor-neutral	Deleted all references to MobileIron and other providers.
141	2	11		35	What about end-to-end encryption?	Text edited to add end-to-end encryption.
298	2	12	II.M	7	Revise entire section to provide standards or requirements. Delete references to commercial firms and their product names.	Text edited as recommended
299	2	12	III	21	These descriptions need to be reconciled with descriptions in Part 1 of handbook. They may not need to be repeated here…	Text removed, architecture and general descriptions of modules contained in Part 1
142	2	12		14	Include data integrity	Text removed, architecture and general descriptions of modules contained in Part 1
143	2	12		18	Again, is this an endorsement? Recommendation? Just an example?	Text removed, architecture and general descriptions of modules contained in Part 1
144	2	12		24	Are these requirements, or examples?	Text removed, architecture and general descriptions of modules contained in Part 1
145	2	13		19	Does this preclude usage, such as USB or Bluetooth to connect to other devices (e.g. Bluetooth link to SatCom module)?	Text removed, architecture and general descriptions of modules contained in Part 1
146	2	13		22	Definition of business rules? Also, does it know the cost to transmit, the amount of data that's being transmitted, current signal strength?	Text removed, architecture and general descriptions of modules contained in Part 1
147	2	13		26	If I have a separate microphone (throat mic) and a separate earpiece, does that violate the "single voice Input/Output (I/O) device"? What if multiple devices have a speaker and microphone? Easy example is a radio, which has a speaker and multiple microphones (typically now), and then an external speaker-microphone Will there be a requirement for a physical interface, including expected impedances and output performance?	Text removed, architecture and general descriptions of modules contained in Part 1
148	2	13		27	How does the user correct any voice-to-text and text-to-voice mistakes? Does speech to text and text-to-voice also cover a vocoder?	Text removed, architecture and general descriptions of modules contained in Part 1
149	2	13		30	Definition of IP-level connectivity? Does one device always act as a local DHCP server, and another device (or same device) act as a router? Will it use private IP space? Prioritized = QoS? Prioritized off what information (source, urgency, etc.)?	Text removed, architecture and general descriptions of modules contained in Part 1

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
150	2	13		35	How will compatibility be maintained and thus avoid vendor lock-in? Sensors should be accessible from incident command/dispatch center	Text removed, architecture and general descriptions of modules contained in Part 1
151	2	13		36	What will the indications be for say, temperature? Would it be the voltage that was being returned if it's an analog sensor, would it be in Fahrenheit, Celsius?	Text removed, architecture and general descriptions of modules contained in Part 1
26	2	13		37 thru 39	Same comments for Page 8 lines 8-10 apply here. Change: add to the physiological sensor list on line 39: Vestibular and kinesthetic information paired with velocity information to report if the responder has fallen as opposed to purposefully repositioning to be closer to the surface.	Text removed, architecture and general descriptions of modules contained in Part 1
152	2	14		1	What will the indications be for say, wind speed? Would it be the voltage that was being returned if it's an analog sensor, would it only provide velocity, direction, is it gusting, how often would it update?	Text removed, architecture and general descriptions of modules contained in Part 1
153	2	14		4	Wouldn't it be potentially necessary to deliver this information to multiple responders (such as atmospheric contaminants)? How would this situation be addressed?	Text removed, architecture and general descriptions of modules contained in Part 1
154	2	14		8	Does this mean that all cameras must have GPS unit? Also recommend that all sensors have consistent time	Text removed, architecture and general descriptions of modules contained in Part 1
155	2	14		10	What if I/O device built into controller module? What if communications device has a display?	Text removed, architecture and general descriptions of modules contained in Part 1
156	2	14		11	Phrasing does not make it clear if both input and output is required	Text removed, architecture and general descriptions of modules contained in Part 1
157	2	14		14	Gestures have to be standardized. Otherwise, user confusion will reign supreme	Text removed, architecture and general descriptions of modules contained in Part 1
158	2	14		17	Should it specify LCD or LED type of display?	Text removed, architecture and general descriptions of modules contained in Part 1
159	2	14		20	What about voice control? Language for voice control should be standardized as well.	Text removed, architecture and general descriptions of modules contained in Part 1
160	2	14		21	Definition of one voice medium?	Text removed, architecture and general descriptions of modules contained in Part 1
161	2	14		22	Haptic feedback may be interpreted as only feedback when typing/touching (perhaps physical is better?)	Text removed, architecture and general descriptions of modules contained in Part 1
162	2	14		28	What if the Power Module is also the Controller Module?	Text removed, architecture and general descriptions of modules contained in Part 1
163	2	14		31	Specify newer connections, such as USB-C. Mini-USB is obsolete (and Micro has a weak connector)	Text removed, architecture and general descriptions of modules contained in Part 1
164	2	14		35	"Time to recharge" - Is there intelligence to this? Does the controller just assume that all device batteries should be at maximum and keep them charged, does it let the batteries cycle? Does the power module know the condition of each device's battery? Should the recharger itself be capable of these?	Text removed, architecture and general descriptions of modules contained in Part 1
165	2	14		36	Might be beneficial to specify USB-PD. 5VDC typically limited to 2.1A, and USB-PD supports multiple voltages Modern continental AC voltage is 120V. Also, doesn't mention frequency such as 60 Hz. Recommendation for AC is 120-240VAC 50-60Hz (supports international as well). What about grounding?	Text removed, architecture and general descriptions of modules contained in Part 1
166	2	14		37	Defining inductive standards such as Qi would be beneficial. Inductive standards do not use 12VDC, 5VDC, or 110VAC.	Text removed, architecture and general descriptions of modules contained in Part 1
27	2	14		9 thru 23	Same comments for Page 8 lines 12-15 apply here Change: The interface should include options for interactions to occur between the device and other team members/devices/databases that do not require the responder to interact. Identification of situations in which automated response interfaces are needed in lieu of responder I/O so that requirements for automated I/O interfaces can be identified and realized in the solutions.	Text removed, architecture and general descriptions of modules contained in Part 1
300	2	15	III.F	Figure 4	Review interfaces and verify that these are the correct ones.	Figure deleted to avoid confusion.
301	2	15	III.G	14 ff	Is it necessary to have all of these models and encoding, or can the list be reduced?	No change made. List is necessary.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
167	2	15		5	What is this figure trying to show, exactly? Is this all within the Controller Module (same color of blue for it), and why would it be defining a non-external interface?	Figure deleted to avoid confusion.
168	2	15		14	Do I then have to support every single format?	No changes made. These are provided as examples.
302	2	16	III.J	32	Recommend this section focus on JSON as the encoding and MQTT as the transport mechanism	No changes made. Protocols and transport still under discussion, will update in next version.
169	2	16		5	This section is particularly nebulous, CAD vendors have different interfaces, let alone all the others	No changes made. Primarily we are focusing on bringing sensor data back to agency, and provide enhanced situational awareness. In large part existing systems will not change.
170	2	16		12	What standard interface is being referred to?	Text revised to reduce confusion regarding HSI interface.
171	2	16		14	HUD/UI should be standardized/defined in terms of layout, how much vision is allowed to be blocked by information, etc.	No change made. We will not be specifying individual I/O characteristics, these will be driven by the marketplace.
172	2	16		16	Is this then on top of Models and Encoding? Do I have to support all of these as well? Are these nice to have, which module has to support this?	No change made. We will not be specifying individual I/O characteristics, these will be driven by the marketplace.
173	2	16		37	Does this mean that there may be multiple devices that are acting as HTTP servers? Presents a large security risk if so	No change made. Different services may point to different servers.
303	2	17	IV.A	15	Recommend further explanation of "sensor hub" (if it doesn't already exist) before it is used here.	Text changed so that sensor hub is clarified as an application/service vice an actual device.
174	2	17		4	Do I need to support all of these? How do I ensure compatibility between all of these different devices?	No change made. These are provided as examples.
175	2	17		20	What is meant by discoverable web interface? How would the associated devices discover it?	Revised description.
176	2	17		26	What is the mechanism used to access and authenticate a valid request from another responder? How is this access restricted?	No change made. This will be based upon user profiles and security policies.
177	2	17		30	"Donning" implies clothing, and sentence also implies that the user is somehow authenticated by this process to enable/register	No change made. Donning is an acceptable term for putting on a SmartHub body-worn device. The user will have to be authenticated (see ICAM comments above) to use a device.
178	2	17		36	Hierarchy should be defined. The root of it should either be a person (if worn) or a device (say vehicle, or deployable)	No change made. Hierarchy depends upon implementation by vendor. Lowest level expected to be on-body system, highest level is agency/enterprise level. Number of intermediate levels depends upon vendor.
119	2	18		4	Does the Sensor Hub then have to support all of those formats? Sensor hub has not been shown in the conceptual drawings before this. Are they separate from the controller? Can the controller be the sensor hub?	No change made. We expect the SensorHub application to support the formats shown in the figure. The SensorHub service could run on a controller or even on a Comms Hub, depending upon the implementation.
179	2	18		8	STA, while open, is being driven by one company	No change made. Noted, but STAPI an open standard. .
180	2	18		16	If MQTT has a close relationship to STA, why are both required?	No change made. MQTT is a transport mechanism, STAPI is an API.
181	2	18		17	How does the sensor hub know which interface to attempt?	Text revised for clarity.
304	2	19	IV.A.1	3	None of the recent integration activities have used a sensor hub catalog, is it (and the discussion about registration) still a viable solution?	No change made. Yes, a sensor hub catalog is still a viable solution.
182	2	19		1	This requires a working knowledge of the STA model, as there's no definitions. Is this mapped out to the third document with actual names? Does the Part 2 Tasking Core in a draft stage affect things?	No change made. STAPI is a published standard. We don't plan to replicate it in the Handbook.
183	2	19		9	Identifier has to be standardized, perhaps look to NIMS for format (Resource Typing or beyond)	No change made. ID could also be Controller MAC address. We will address this as we deal with ICAM.
184	2	19		17	What if my sensor is a simple closure (gun removed from holster), or a simple temperature sensor? Does it have to be intelligent and online?	No change made. We expect all sensors will either have drivers or be more intelligent than just a simple switch closure in order to provide status.
185	2	19		20	Is the UUID for every sensor? Who assigns the UUID?	No change made. ID could also be MAC address or other unique ID (e.g., model and serial number combination) . We will address this as we deal with ICAM.
305	2	20	IV.A.1	Figure 7	What is the format of the GetCapabilities Response - what does this data string look like? Also, what is the format and contents of the Metadata and Status	No change made. Contained in OGC standards, will not replicate in the Handbook.
186	2	20		1	How is each capability formatted? What happens if there's a capability the sensor hub doesn't recognize? Where does the Hub Catalog come from and reside?	No change made. We will investigate if SOS/STAA or IoT standards have a capability dictionary. Standards are maintained by OGC.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
187	2	20		5	Are there any security risks? How do I know that the sensor that's trying to communicate should be communicating with me?	No change made. Will be included as part of ICAM development efforts.
306	2	21	IV.A.6	28	Change from "…allow a privileged user to…" to "..allow authorized personnel, based upon permissions, profiles and roles to…"	Text edited as recommended
307	2	21	IV.A.7	36	Change …present the user…" to "…present the user or administrator (based upon roles and permissions), …"	Text edited as recommended
188	2	21		1	The proper behavior absolutely has to be defined. There could be considerations for a "typical" loadout, and then any additional devices beyond this.	No change made. Will be considered for future version of handbook. We will work to identify standards for the entire registration/deregistration. OGC has standards in place.
189	2	21		2	Experiment?	Reference to "the experiment" deleted, this actually pointed back to Spiral 0 /1 work.
190	2	21		10	Primarily used, who else is providing? Are there government plans?	No change made. There may be GOTS applications (e.g.., ATAK) that are installed on a controller.
191	2	21		13	SMS being a cellular feature? What about for other communication methods?	No change made. List provided as examples, if the controller is a smartphone then SMS would be included.
192	2	21		20	The Controller Module has Sensor Drivers, where is the Sensor Hub?	Fact noted elsewhere in text that Sensor Hub is an app/service running on the controller.
193	2	21		23	Compatible drivers for what platforms? Windows, iOS, Android?	No change made. Platforms include Windows, iOS and Android. Also potentially Raspberian for Raspberry Pi-based devices and Linux for Linux-based devices (that are neither Raspberian or Android).
194	2	21		32	Why isn't it required that a user is able to access the administration by the Controller Module?	Text changed to indicate authorized personnel. The level of access would be based upon ICAM, user profiles and agency policies.
195	2	21		35	Status of connected devices is missing	Text added regarding status of all connected modules.
196	2	22		5	Was Uniform Resource Locator meant?	Correction made as noted.
197	2	22		7	Power details of attached devices as well?	Text edited to include details of attached devices.
198	2	22		19	What happens if the local user changes conflict with policies set up beforehand? And what if the user goes back into coverage?	Text changed throughout to indicate access based upon permissions. The level of access would be based upon ICAM, user profiles and agency policies.
308	2	23	IV.A.9	4	Change "… allow a user to…" to "…allow a user or administrator (based upon roles and permissions), to…"	Text edited as recommended
199	2	23		1	Would "user" be customized based off each person's login?	No changes made. Part of user profile.
200	2	23		4	This should be done remotely, not locally, and profiles pulled down	No changes made. This would also be part of the user profile and ability to establish / change the rules will be profile-based as well.
309	2	24	IV.A.10	4	Change "… allow a user to…" to "…allow a user or administrator (based upon roles and permissions), to…"	Text edited as recommended
201	2	24		1	Should include debounce capabilities	No change made. That level of specificity is outside the scope of the handbook.
202	2	24		3	This needs a lot more detail	No change made. That level of specificity is outside the scope of the handbook.
203	2	24		6	This should be done remotely as well	No change made. This would be based upon how the sensor vendor designed the sensor/driver/app. Not part of the handbook.
310	2	25	IV.A.11	6	Change "… Users should…" to "…Users or administrators should (based upon roles and permissions)…"	Text edited as recommended
204	2	25		3	What controls the drop downs?	No change made. Vendor designs drop-down, level of user access to set/modify based upon profile. We will develop language to address the ICAM and profile issues in future version.
311	2	26	IV.A.12	8, 12, 13, 16	Change "… user or administrator…" to "…user or administrator (based upon roles and permissions)…"	Text edited as recommended
312	2	26	IV.A.13	21	Change "… allow a user to…" to "…allow a user or administrator (based upon roles and permissions), to…"	Text edited as recommended
205	2	26		2	How is the information tagged to show that it's coming from a different device? How is duplicated transmissions handled? What about alert parameters for adjacent units? Example is if you're a firefighter and a PASS alarm goes off on another firefighter with you	No change made. Data from each device would have to be tagged with device ID. STAPI provides this. How alerts were shared among Responders would depend upon system configuration and communications.
206	2	26		9	Would only the Controller Module have storage, or would other devices have storage? What if the camera has a buffer built into it, or if a device has to hold readings during lack of connectivity (or is that the Controller's responsibility?)	No change made. This would be determined by the vendor. At a minimum, the controller would have the primary storage.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
207	2	26		17	Is that data push something centrally managed, remotely changeable	No change made. This would depend upon the agency policy and associated system configuration.
208	2	26		22	Include Fully Qualified Domain Name (FQDN)	Text edited as recommended
209	2	26		27	Time should be based off of GPS to ensure conflicts	No change made. Time standard will be controlled/mandated by agency based upon the time standard used for existing systems.
210	2	26		28	Some device, most like the controller, must have GPS capability	No change made. Can't guarantee GPS reception in all operating areas. We expect that, at a minimum, the controller will have GPS capability.
211	2	27		1	How does this display adapt for an I/O device on the user? Would a native app be acceptable for that environment?	All references to a specific product deleted, including screen shots.
212	2	27		11	What about a radio that has P25, LTE, and BT capabilities such as the Harris XL-200P?	No change made. Only if the XL-200P allows applications to run on it.
213	2	27		23	PTT doesn't have to be simplex, such as TETRA	Noted. Punctuation added for clarity.
313	2	28	IV.B.1	23	Voice Design and Data Design appear to be the same, need to review to determine if information can be provided in one section vice two	No change necessary for now, any reorganize sections in a future version.
214	2	28		4	Is the Sensor Hub now gone? Why is the Comms Hub now shown to connect to the Sensor Modules? Page 12 Line 24 shows the Controller Module communicating with the Sensor Modules	No change made. Sensor Hub is a service running on the Controller, diagram shows communication connections to/from comms hub. Sensors may communicate via comms hub.
215	2	28		8	Should weigh for transmission costs (SatCom very expensive, high latency)	No changes made. Transmission costs part of business rules, but overriding factor will be priority of message - emergency messages go fastest, most reliable way, no matter what the cost.
216	2	28		32	Should specify minimum version (5 as an example which has latest LE implementations) What about minimum Bluetooth protocol supported?	Changed BLE to BLE 4.0 or higher throughout document.
217	2	28		34	USB ver. 3 is no longer a version, there is 3.1 Gen 1 and 3.1 Gen 2. 3.2 is in development, and it will change the names. USB 3.2 Gen 1x1, 1x2, 2x1, and 2x2	Remove version numbers completely and changed to "all approved versions".
218	2	28		35	Recommend just TRRS, along with capability of being mechanically secured into position	No changes made. Specifying just TRRS may not be compatible with off the shelf components, same with specifying locking connectors.
219	2	28		36	Physical interface should be standard in addition to protocol	Changed text to indicate Ethernet as an example.
220	2	29		1	How do these connect to Comms Hub? Does it have to have non-mission critical PTT? What about Bluetooth?	No change made. List provides control functions, not connections.
221	2	29		6	Need to define Bluetooth/USB versions	Changed to "all approved versions" for USB, BLE 4.0 for Bluetooth
222	2	29		8	Need to define Bluetooth/USB versions	Changed to "all approved versions" for USB, BLE 4.0 for Bluetooth
223	2	29		9	Physical interface should be standard in addition to protocol	Changed text to indicate Ethernet as an example.
224	2	29		15	What value is this section adding? It's a duplicate of Voice other than Interface B	No change necessary for now, any reorganize sections in a future version.
314	2	30	IV.C.1.a	26	Change "… allow the user to…" to "…allow the user or a administrator (based upon roles and permissions), to…"	Made recommended change.
225	2	30		3	Add Mil-Spec, water resistance, intrinsically safe for fire. 1802 is not a certified standard yet	Added reference to NFPA 1800. Still working with NFPA to identify correct standards. Current standards as per NFPA include NFPA 1800 and NFPA 1802. Not planning to incorporate Mil-Spec in the handbook at this time.
226	2	30		10	Format should be defined (automated alert), and rules should be configured by administrator as to desired response (initiate voice and body cam transmission as an example, voice priority in system)	No change made. Alerting still under development, exact actions will be agency-configurable.
227	2	30		20	How is the radius for this alert defined?	No change made. Radius will be part of alerting protocols and will be agency configurable.
228	2	30		28	I'm not fond of being able to enter manual locations, it's too easy to forget to change (or someone moves). I would have a system that flags that the location has been manually entered	No change made. Manual location entry necessary for items lacking internal location capability (e.g., locations of fires, vehicles, debris, buildings, etc.).
315	2	31	IV.C.1.f		Add section "f" to discuss the recommendation that location data be transmitted based upon speed, change in location, mission, etc. to reduce unnecessary data loading.	Made recommended change.
229	2	31		6	Cold start/warm start specifications? GPS and GLONASS? Assisted GPS should be required for any cellular devices	Replaced GPS throughout with the generic GNSS. Updated location references to add language for cellular device location capabilities.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
230	2	31		19	Proprietary should not be allowed. Any proprietary gets vendor lock-in, and is anathema to the whole process	No change made. Proprietary between sensor and device driver / app is acceptable. Expecting vendors to create device interfaces (e.g., sensor to smartphone) just to meet NGFR standards is not logical, but having their app/driver communicate with the NGFR on-body system on the controller via API is logical.
28	2	31		6 thru 8	GPS should be capable of being combined with other location sensor information such as inside beacons to provide more targeted information. The system should be capable of identifying environments in which these sensors exist; it should combine the GPS data with the granular beacon data for responders to immediately access and use. Change: Add after last sentence on line 8: The system should be capable of identifying environments in which these sensors exist; it should combine the GPS data with the granular beacon data for responders to immediately access and use.	Text updated to indicate use of additional location services.
231	2	32		1	What if the communications hub or Controller Module has the location capability into it? Does it need to send to the sensor hub, then back to itself?	No change made. Yes, if the SensorHub service is collecting and publishing all sensor data.
232	2	32		13	How would categories be defined for each sensor type (visible, IR, etc.)? How would it be indicated if it was body-worn, fixed, handheld, drone, etc.?	No change made. Sensor Things API allows for description/identification of the sensor and what it is observing.
233	2	32		28	Does it have to be Internet, or what about a private network?	Reworded to indicate generic wide area (or agency) network or Internet.
234	2	33		1	This is confusing. The arrow is pointing in one direction, and the camera icon is pointing in the exact opposite. Which way is the camera facing? And why would there be two icons, necessarily? Unit number, officer name, other information is missing What if there are PTZ controls?	Image reworked to rotate camera icon 180 degrees so apparent view matches picture.
235	2	33		16	GPS should provide timing	No change made. Agencies systems use specific time sync services, we do not plan to dictate which service they should use.
316	2	34	IV.D	1	The "Hybrid Module" has always seemed to be a confusing concept within the Handbook. Unless input from other reviewers indicates it has value, I recommend it be replace with the "lightweight"-specific design concept to identify the minimalist version of the SmartHub configuration.	No change made. Will be incorporated into a later version of the handbook.
236	2	34		1	Where is this coming from? Definition is narrow	No change made. This is the definition we are using.
237	2	34		2	Should the hybrid module include the controller hub (user interface to deliver sensor information)?	No change made. Controller is part of the hybrid model - the SensorHub would be a service on the controller.
317	2	39	IV.D.2	5	Delete reference to Smartwatch - not necessary	Made change as recommended.
318	2	41	IV.E.1	30	Change "STA" to "STAPI" (applies to entire document)	Made change as recommended.
319	2	41	IV.E.1	31	WMS is referenced within document, but is it in use or planned for use within the SmartHub architecture?	No change made. Yes, it should be available for use.
320	2	41	IV.E.1	34	Don't end the sentence with "to".	Made change as recommended.
321	2	42	IV.E.2	18	Change "… allow a user to…" to "…allow a user or administrator (based upon roles and permissions), to…"	Made change as recommended.
322	2	43	IV.E.2.b	Figure 26	Does this interface agree with STAPI?	No change made. This is similar to STAPI.
323	2	45	IV.E.3	10	Change "… a user needs to…" to "…a user or administrator (based upon roles and permissions) needs to…"	Made change as recommended.
324	2	45	IV.E.3.f	20	Change "… a user with elevated privileges needs to…" to "…a user or administrator (based upon roles and permissions) needs to…"	Made change as recommended.
325	2	46	IV.E.3.i	16	Change "… a user to…" to "…a user or administrator (based upon roles and permissions) to…"	Made change as recommended.
326	2	46	IV.E.3.j	22	Change "… a user to…" to "…a user or administrator (based upon roles and permissions) to…"	Made change as recommended.
327	2	46	IV.E.3.k	29	Change "… a user to…" to "…a user or administrator (based upon roles and permissions) to…"	Made change as recommended.
328	2	46	IV.E.3.k	31	Change "… the user to…" to "…the user or administrator (based upon roles and permissions) to…"	Made change as recommended.
329	2	46	IV.E.3.k	32	Change "… the user to…" to "…the user or administrator (based upon roles and permissions) to…"	Made change as recommended.
330	2	47	IV.E.3.l	2, 3, 5, 7, 8, 10, 11	Change "… user …" to "…user or administrator (based upon roles and permissions) …"	Made change as recommended.
331	2	47	IV.E.3.m	14	Change "… a user to…" to "…a user or administrator (based upon roles and permissions) to…"	Made change as recommended.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
332	2	48	IV.E.3.p	Figure 27	Does this interface agree with STAPI?	No changes made. No. STAPI is different from the Sensor Hub registration / discovery interface, although discovery is possible via STAPI.
37	2		2.B		b. To: Communications must bridge voice and data across disparate pathways [e.g., voice over Land Mobile Radio (LMR) to cellular]. In addition to integrating with LMR, a responder or agency must be able to identify and prioritize critical communications over routine communications. For example, emergency communications shall be transmitted using the fastest and most reliable pathways, while lower priority data can be transmitted using alternate pathways that may use a store-and-forward process to transmit the information.	Text in recommendation is identical to existing text, no change made.
38	2		2.B		In the event of a loss of connectivity, information shall be cached locally until the required network regains connectivity. As part of the communications prioritization and caching capabilities, the Responder SmartHub shall automatically re-connect to a network when available and control the transmission of cached sensor data as a lower priority than the current sensor data.	Made change as recommended.
39	2		2.B		The Responder SmartHub shall secure all communications. The Responder SmartHub will allow a responder or agency to configure the various network settings to allow the responder to connect to different, multiple networks, and configure those connections by the Responder SmartHub. This process enables public safety agencies to set the business rules for how information is routed to and from various communication systems.	Made change as recommended.
40	2		2.B		It is anticipated that an incident could experience challenged communication links because of its location and/or type of disaster. The capability to priorities and to provide continuity by smartly recovering sensor device data is a critical capability for the controller / smart hub devices to ensure an accurate situation awareness.	Noted, no change made.
41	2		3.K Device Identity Management		Device identity management involves assigning Unique Identifiers (UID) with associated metadata to sensors, devices and objects, enabling them to connect and communicate with assurance to other system entities over network.	Made change as recommended.
48	2		4.A.1		a. Change section title to Section 5.A.1 Responder Sensor Hub: Registration	Made change as recommended.
49	2		4.A.1		b. To: A key capability of the sensor hub is sensor discoverability, including on-body, off-body and Smart City sensors. For this to work, first responder's sensor hub must be registered with a sensor hub catalog. A key element of an effective NGFR architecture is an awareness by all users of the deployed human resources so they can be effectively used and protected. Critical in this process is the registration of the systems deployed on a responder and information on their identity. For equipment deployed on a responder, it is likely each responder will have a unique identifier. This identifier will be entered and can be used to configure equipment deployed on a responder. A sensor hub identifier form needs to be defined, but the primary goal is to identify the responder on which the sensor hub is deployed.	Made partial changes as recommended, but not addressing Smart Cities in this version
50	2		4.A.1		Registration and discoverability is performed by the sensor hub. The sensor hub/hub catalog combination ensures that the sensors for all responders on-scene that are capable of registration will be registered and discoverable. The Catalog Service for the Web (CSW) Catalog Record previously referenced in this document specifies the minimum output standards that sensors should be ready to provide the catalog, this becomes the minimum set of attributes that a sensor catalog should contain. The overall registration process is shown in the sequence diagram below. When a sensor hub boots and comes online, it sends a request to the publishing service (potentially a regional Sensor Hub, a Web Feature Service (WFS) or a CSW), which then harvests the sensor hub capabilities and populates the catalog with all sensors devices associated with First Responder as necessary. The publishing service returns the identification (ID) of the entry (as a Universally Unique Identifier (UUID)) for each sensor device so that the sensor hub can update or remove the entry as its status changes.	Made change as recommended.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
51	2		4.A.13 Device Configuration		The Controller Module should allow a user to modify any device configuration settings. These settings may include: • Hostname configuration; • Email configuration; • MQTT configuration; • SMS configuration; • Date and time configuration; and • Default geospatial location of the device (if no GPS is present). Regarding the bullet on date and time configuration, that configuration should be synchronized across all devices using UTC or Zulu.	Made change as recommended.
52	2		4.A.15 Time Clock		Add this new section. All messages and logs should use synchronized time clock based on the synchronized UTC or Zulu time clocks.	Included note that time should be synchronized by agency standard.
53	2		4.A.5		b. To: The Controller Module is expected to host the various drivers used to interface with the multiple sensors, I/O devices and other modules used by first responders. Because there is no standardized sensor driver that will work with all sensors, each sensor manufacturer will have to provide a compatible driver for its associated sensor. These drivers may be installed on the controller along with the corresponding applications, or bundled separately by the agency and delivered as a single driver package.	No difference in wording from existing text, no change made.
54	2		4.A.5		Sensor manufacturers should build libraries in commonly used programming languages such as Java, Python and C, compatible for Android, iOS, and other operating systems, so they can easily be integrated into the NGFR Architecture.	Made change as recommended.
55	2		4.A.9 Rules Management		The Controller Module should allow a user to create complex Boolean logic rules that, when matched, can trigger the hub to perform an action. Actions can include tasking devices or sending alerts by a variety of channels including email, text messages and MQTT topics. Email and text support allows for existing devices without specialized applications to receive the alerts, while MQTT delivers alerts to applications incorporating MQTT clients as shown in Error! Reference source not found.. MQTT topics assist by more easily identifying the content of sensor messages in an organized fashion, for example, certain data transmissions can be labeled as heartrate or humidity readings and assigned to Responder A and Responder B. It makes it easier to work with, prioritize, and therefore manage. This Handbook is intentionally silent on how to label or structure message topics to provide maximum flexibility in the field.	Made some of the recommended changes. Still developing guidance for MQTT topics, will not be included in this version.
56	2		4.B		a. Besides the emphasis on monitoring the connection and determining best available connection, this section should also give additional guidance for the need to establish prioritization of the messages and other data, both in terms of criticality and time sensitivity. This is addressed further in Section 4.4.3 below titled in Message Payload Transmission Priority.	No changes made. Message prioritization will be agency configurable and not prescribed in the Handbook.
57	2		4.C		a. Add Section 5.C.4 Sensor Unique Identifiers – A sensor should also transmit its UID along with location coordinates to allow other systems to associate the location with the registered first responder.	No changes made to this version. Standard sensor data payloads under development.
42	2		4.C Sensors		b. To: There are numerous requirements for sensors (see Part 3, Appendix J). Required base modules will include sensors for physiology, environment and imagery. Sensors will use a variety of protocols and wired/wireless connections to deliver sensor data to the Controller Module. Sensors should be developed with different applications in mind, for example some maybe on-body and therefore associated with a specific first responder (example: body camera or heartrate monitor), a similar sensor may be deployed off-body at the incident site (example: drone camera), a similar sensor may be accessed from a Smart City network (example: camera mounted to a building on a street corner).	Made some of the recommended revisions, do not want to delve deeper into sensor requirements in this version or address Smart City networks.
58	2		4.E.3.i Rules Management		a. This section is duplicate of 5.A.9. Recommend removing or adding the following reference at the end of the section: i. From: The controller should allow a user to create complex Boolean logic rules, that when matched can trigger the controller to perform an action. Actions can include tasking devices or sending alerts by a variety of channels, including email, text messages and MQTT topics. Email and text support allows for existing devices without specialized applications to receive the alerts, while MQTT delivers alerts to applications incorporating MQTT clients. For more information see Section 5.A.9.	Edited to indicate rule modification based upon roles and permissions.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
59	2		4.E.3.l Data Management		To: The Controller Module should also allow a user to prioritize the transfer of data. The user should be able to indicate the importance of specific types of data. For example, the user may want current data over cached data, audio to take precedence over video; however, gas readings may take precedence over audio. The user should also be able to specify permitted reductions to data if they are necessary. For example, a user may want to reduce video from 30 FPS to 10 FPS if bandwidth is an issue, or to push sensor readings less frequently than they are captured	Revised the section to indicate that data priority is configurable based upon roles and privileges.
60	2		4.E.o Register Sensor Hub Service and p General Workflow		One important aspect of the Controller Module ecosystem is the ability to discover sensor hub services based on its connected sensors, with which the responder can communicate. By registering with a sensor hub catalog with a unique identifier of the sensor hub and each of its sensors, Controller Module sensor hub services can be distinguished from each other and allow discoverability of the available sensor hub services. By also registering the sensors using UID, it will also allow wireless sensor to be swapped between smart hubs while maintain integrity of the transmitted data as well as support IP aware sensors, which are capable of streaming data directly and not connected to a smart hub. See Section 5.A.1, 2 and 3 for more information.	Concur. No changes made.
61	2		4.E.p Register Sensor Hub Service and p General Workflow		Discoverability is dependent on a Controller Module knowing how to communicate with a sensor hub catalog or its associated publishing service. Once a sensor hub service on a Controller Module has been configured to communicate to one of these services, the sensor hub service is able to add itself to the connected service, which then retrieves the sensor hub service capabilities, adds the capabilities to the catalog and returns a unique identifier for the sensor hub service to use in later updates. The sequence diagram below depicts this workflow.	Recommended text identical to current text, no change needed.
43	2		4.G Models and Encoding		a. From: Observations and Measurements; b. To: Observations and Measurements (OGC Observations and Measurements v2.0 also published as ISO/DIS 19156) a. Add bullet - International Organization for Standardization (ISO 8601)	Made recommended change.
44	2		4.J Communication Protocols		Change "BTLE" to "BLTE or BLE"	Made change from "BTLE" to "BLE" throughout document.
45	2		5 B.1 Voice Design		Bluetooth – All approved versions mentioned twice. Change to Bluetooth Version 4.2 and above.	Changed to Version 4.2 and above
46	2		5 B.2 Data Design		Bluetooth – All approved versions mentioned twice. Change to Bluetooth Version 4.2 and above.	Changed to Version 4.2 and above
47	2		5.A.1		a. Add diagram to this section with definitions listed below. Figure 8 - Sensor Catalogue Layout § On-body sensor – sensor that exists on a first responder's body § Sensor Hub (also known as SmartHub) – this hub exists on the first responder's body § Incident Sensor Hub – exists with the incident commander - Sensor Hub Catalog – recommend changing to sensor catalog - Off-body sensor – exists at an incident, may be a deployable sensor at the site or mounted to a drone (i.e. camera) - Smart City Sensor – fixed sensor asset that exists after the incident has ended - Regional Sensor Hub – city or county asset that exists after the incident has ended - Regional Hub Catalog - city or county asset that exists after the incident has ended	No change made. Sensor Hub and Smart Hub are different. No diagram needed. No smart city information planned for handbook at this time.
62	2		Appendix A Acronyms		Recommend using acronym STAPI for Sensor Things API. STA stands for Secure Token Authority.	Made recommended change.
86	2		F		the other information required could come from what is currently in NFPA 950 for minimum requirements or what is recommended in NFPA 951.	Referenced NFPA 950 and 951 as potential guidance
63	2		Section 2		Add Personas to Part 2 Section 3 Responder SmartHub High Level Requirements	No change made. Still evaluating need for Personas and, if necessary, incorporate as part of Personal Profile section in next version of the handbook.
64	2		Section 3		2. Adding Post to Git along with Develop Aids ?????	This recommendation is misplaced. Unable to match to any section of the handbook. No change made.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
65	2		Section 5.E		Interactions, Protocols, Messages, Payloads, Power – The section header title or the sub-titles need to be refine. Given the current title the reader might expect the items in the header title to be the sub-section titles (and corresponding content), but then the content of the paragraphs is framed in a different way – Controller Module-Comms Hub Module Interface, Controller Module-Sensor Interface, etc. Alternatively, instead of changing section header or sub-section titles, insert an introductory paragraph above "Controller Module-CommsHub Module Interface".	Change Section Header to "Interface Descriptions"
66	2		Section 5.E.3.p General Workflow		1. Delete graphic from this section, it is a duplicate of 5.A.1 2. Delete the second paragraph, duplicate of content in 5.A.1 3. Append the following to 5.E.3.o: Discoverability is dependent on a Controller Module knowing how to communicate with a sensor hub catalog or its associated publishing service. Once a sensor hub service on a Controller Module has been configured to communicate to one of these services, the sensor hub service is able to add itself to the connected service, which then retrieves the sensor hub service capabilities, adds the capabilities to the catalog and returns a unique identifier for the sensor hub service to use in later updates. The sequence diagram below depicts this workflow.	Changes made as recommended.
67	2		Various		Remove all references to specific products, specifically: - MobileIron - Compusult - SensorUp - Noblis	References to commercial products removed.
333	3	8	I	1	Is it necessary to repeat the overview of the system for each Section? I know there was a philosophy at one time that each Part could be a stand-alone document, but maybe we can reduce redundancy by referring the reader to Part 1 for the Overview. This would also apply to Part 2's Overview section. This would allow NGFR to only maintain one version of the Overview and reduce the possibility of discrepancies among the three Parts.	System overview moved to Part 1
334	3	8	II	18	Ditto. Looks like only Figure 1 and the information starting with Section II.G are different from Parts 1 and 2.	System overview moved to Part 1
253	3	8	II		added text - Although certain functions of the system are depicted in separate modules, a given product implementation (e.g. a smartphone) may include functions from multiple modules within a single physical component, as long as the specified logical and physical interfaces are implemented so that individual modules can still be mixed and matched when needed	Accepted. Added recommended text and also referred to "Hybrid Module" in Part 2.
254	3	9	II.A		added text - Additionally, it serves to connect, power, and mediate data flow between the other SmartHub modules. A specific Controller role is to manage the transformation of sensor information between the local protocols used by sensor devices, the Internet protocols used for external communication, and the user interfaces that enable the wearer to interact with and act on emergency scene information.	Accepted. Revised as follows. Additionally, the Controller serves to connect, power, and mediate data flow between the other SmartHub modules. A specific Controller role is to host sensor drivers, as necessary to allow for sensor data to be transformed (if necessary) from the local protocols to the protocols used for external communication and also to the user interfaces that enable the wearer to interact with and act on emergency scene information.
255	3	9	II.B	17	replaced text - The CommsHub performs "intelligent router" functions that match voice and data traffic with channel performance in order to maximize throughput and to fulfill transmission or quality-of-service priorities that have been set either by the wearer or through authorized command directives	Accepted. Revised as follows. Additionally, the Controller serves to connect, power, and mediate data flow between the other SmartHub modules. A specific Controller role is to host sensor drivers, as necessary to allow for sensor data to be transformed (if necessary) from the local protocols to the protocols used for external communication and also to the user interfaces that enable the wearer to interact with and act on emergency scene information.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
256	3	10	II.C		replaced text - Sensor Modules provide standardized sensor information and readings to the Controller through a wired or local wireless connection. They are intended to be relatively lightweight, inexpensive combinations of sensor devices, interface processors, and communications devices. Wireless Modules must also include their own power supply while wired Modules may draw power from the Controller they are connected to. Sensor Modules may also include tasking capabilities that allow sensor configuration parameters to be set or specific measurement events to be triggered. Sensor module outputs are passed to the Controller for further processing, storage, access by user applications, and transmission to other response components. Sensors included in this design are specifically configured to connect locally with a Controller SmartHub. A SmartHub may also have access to other sensors, both fixed and mobile, in and around the incident scene. This access would occur, however, through the CommsHub and by way of other SmartHub / SensorHub components that those sensors connect with or deliver their readings to.	Accepted. Revised as follows. Sensor Modules provide standardized sensor information and readings to the Controller through a wired or local wireless connection. They are intended to be relatively lightweight, inexpensive combinations of sensor devices, interface processors, and communications devices. Wireless Modules must also include their own power supply while wired Modules may draw power from the Controller to which they are connected . Sensor Modules may also include tasking capabilities that allow sensor configuration parameters to be set or specific measurement events to be triggered. Sensor module outputs are passed to the Controller for further processing, storage, access by user applications, and transmission to other response components. Sensors included in this design may be configured to connect locally with a Controller driver, MQTT Broker, or SmartHub service. A SmartHub may also have access to other sensors, both fixed and mobile, in and around the incident scene. This access could occur, however, either through the Comms Hub or a Controller acting as a Comms Hub and by way of other SmartHub / SensorHub components with which those sensors connect or deliver their readings. It is expected that sensor vendors will provide applications and/or drivers that will provide standard APIs to facilitate integration with the sensor support application. It is likely the sensor support application will need to perform data conversion to make sure that data conforms to a uniform standard to ensure the data can be readily consumed and analyzed by the agency.
257	3	11	II.D		replaced text - Each Human Interface Device (HID) device supports one or more of graphical, text, voice, audio, and haptic (touch) means to input and output information. It is expected that this will be an area of particularly rapid innovation in order to reach the right balance of information versus distraction for each individual first responder situation, task, and role	Accepted. Revised as follows. Each I/O Module supports one or more of graphical, text, voice, audio, and haptic (touch) means to input and output information. It is expected that this will be an area of particularly rapid innovation in order to reach the right balance of information versus distraction for each individual first responder situation, task, and role In order to comply with the general "hands free" concept for NGFR, system inputs will probably be primarily voice commands and system outputs will probably be haptic and/or aural.
258	3	11	II.D.1		replaced text - Graphical HID includes graphical displays such as touch screens, heads-up graphical displays, and even Augmented Reality (AR) displays that graphically enhance what a first responder observes, adding for example FLIR heat imagery. These are expected to be general-purpose devices, with the specific graphical interactions such as map displays determined by the particular SmartHub applications that drive them.	Accepted. Revised as follows. Each I/O Module supports one or more of graphical, text, voice, audio, and haptic (touch) means to input and output information. It is expected that this will be an area of particularly rapid innovation in order to reach the right balance of information versus distraction for each individual first responder situation, task, and role In order to comply with the general "hands free" concept for NGFR, system inputs will probably be primarily voice commands and system outputs will probably be haptic and/or aural.
29	3	11		15 thru 22	Haptic needs to be expanded to kinesthetic so that touch by hands is not the only I/O. It needs to include sensory exchanges with other parts of the body for exchanging information regarding orientation and direction changes the responder needs to make to reach a specific location. Change: wherever it says haptic change to haptic/kinesthetic. Add sentence on line 17 after the word "environment:" Kinesthetic I/O will exchange sensory data with touch at various parts of the responder's body rather than relying on fingers, vision, or voice."	Text changed as recommended.
259	3	12	II.D.2		replaced text - Text HID includes physical and graphical keyboards, and text-capable outputs, such as scrolling text displays, digital signage, heads-up text displays, etc.	Accepted. Revised as follows. Text I/O includes physical and graphical keyboards, and text-capable outputs, such as scrolling text displays, digital signage, heads-up text displays, etc.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
260	3	12	II.D.3		replaced text - Voice/Audio/Video HID includes devices that allow users to interact with SmartHub applications using voice or other audio signaling, as well as facial imaging. Voice recognition and/or synthesis may be limited within a portable HID module, but such a component at a minimum will be capable of exchanging high-quality audio with SmartHub applications that do perform these operations either locally or through remote cloud processing (as per the current commercial state of practice). Given the environments in which first responders operate, voice command interfaces will at least initially be limited to specific, predefined interactions with the highest priority for hands-free use ("nearest exit!"). Any voice/audio/video HID will likely also serve as the user interface for unified voice communications that include 1:1 and group conversations, voice / video messaging, and even step-by-step instructions for complex tasks	Accepted. Revised as follows. Text I/O includes physical and graphical keyboards, and text-capable outputs, such as scrolling text displays, digital signage, heads-up text displays, etc.
261	3	12	II.D.4		replaced text - Haptic or touch sensation is an important component of mobile user interaction, especially in chaotic sensory environments such as emergency scenes. Haptic feedback such electromagnetic or vibratory effects can be used to output succinct information such as alerts. It can also provide confirmation that user haptic inputs such as touch screen entries have been received or accepted.	Noted, but no change made. Do not plan to go this level of specificity in this version.
335	3	12	II.G	10	I don't believe anyone of the NGFR spiral performers have implemented any of these interfaces. Do we anticipate that they will eventually be necessary?	No change necessary. Module-to-module interfaces will be tested in Spiral 3.
262	3	13	II.E		replaced text - Location Modules provide standardized location information and readings to the Controller through a wired or local wireless connection. Location readings of SmartHub location are provided using a combination of GPS receivers, wireless triangulation, dead reckoning, image recognition, and any other applicable outdoor / indoor technologies. The Controller can synthesize location information with other sensor readings to provide more intelligent situational awareness to the user and upstream to incident command.	Accepted. Revised as follows. The Location Module returns location to the controller from a location provider. More than one location module or location source may be connected to the controller, each returning a different type of position/location. For example, a responder's controller could be connected to an indoor location provider and a GPS provider. Responder location accuracy will depend on the various technologies used by Responder SmartHub to determine location, and how or if the Controller performs deconfliction of location data when multiple location services/modules provide locations that differ from one another by a configurable amount.
263	3	13	II.F		replaced text - The Power Module provides power to the SmartHub system through the Controller. The Power Module is in essence a "smart battery", able to relay status and charge information to the Controller, supporting both wired and wireless charging, and be swapped while the system is in operation. An advanced Power Module are also capable of adjusting their output according to user priorities and the needs of the other system components as managed by SmartHub services. For example, a first responder might choose between longer battery life or faster streaming video depending on the situation at hand.	Accepted. Revised as follows. The Power Module is in essence a "smart battery", able to relay status and charge information to the Controller, supporting the charging of modules (where applicable), and be "hot-swapped" without affecting the operation of the system. User management of the Power Module could incorporate the ability to adjust the power supplied to the modules according to user priorities and the needs of the other system components.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
264	3	18	III	5	added section - III. Information and Computation Design This section describes the information types and exchanges that the SmartHub system supports. A Information Models This section specifies the conceptual information models and types processed by each module. It follows the general pattern of conceptual models or schemas that describe information on any technology platform. Applications schemas are then built from the conceptual schemas for specific platforms and communities. Information encodings conforming to application schemas then define the format and content of messages by which system components exchange information for particular services and applications. 1. I/O Module information [Note - I/O Module is used throughout the Handbook, HID only appears in edits recommended by ArdentMC. If we change I/O Module to HID, we will need to make changes in all three parts of the Handbook (i.e., globally)] These are the general types of information that are a SmartHub system wearer interacts with through installed I/O modules in the context of interaction with SmartHub applications. Corresponding information types are also exchanged between the other modules in order to provide support I/O information. These general types are described below. a. Alerts/Warnings Alerts and Warnings are reserved for information that is time or location critical. A warning represents a situation of elevated risk to the first responder or surrounding community. An alert represents a situation of high risk to the first responder or surrounding community, where action needs to be taken to avoid injury, death, or significant damage to property. The SmartHub may be configured to warn the first responder that they are entering an area with reduced oxygen, based on pre-configured thresholds. The SmartHub may then alert the first responder to the reduced oxygen situation if the oxygen percentage continues to fall or if the first responder reaches an operational (timing) threshold in the reduced oxygen environment.	No change made. New proposed section. Major restructuring of the handbook will be deferred to next revision cycle.
336	3	18	III	6ff	I don't believe anyone of the NGFR spiral performers have implemented any of these interfaces. Do we anticipate that they will eventually be necessary?	No change necessary. Module-to-module interfaces will be tested in Spiral 3.
250	3	18	III.A	8	Update to specify used of USB-C for USB power delivery - This section describes the interfaces between the Power Module and the Controller Module. This information is provided as an expansion of the interface in Smart Battery Data Specification to provide the necessary communication between these two modules. Only the data set and communication interface should be taken from the Smart Battery Data Specification. The SmartHub uses USB-C following the USB Power Delivery specification for the physical connection between components of the Power Module – Controller Interface. It does not use the SMBus indicated in the Smart Battery Data Specification. The two main interfaces between these Power Module and the Controller are the IPowerModule interface and the IController_PowerUpdate interface. IPowerModule supports communication from the controller to the Power Module, while IController_PowerUpdate supports communication from the Power Module to the controller. Communication between these modules is also supported by secondary interfaces and enumerations, which represent discrete pieces of information.	No change made. May update next update cycle. As of today we haven't evaluated harnesses for use. There may be a variety of connector solutions possible so specifying a single connector type may be too prescriptive.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
265	3	18	IV		added section - IV. Engineering Design A good conceptual design can have any number of distinct implementations that leverage distinct technology platforms or make differing engineering choices to address the specific priorities of target users and applications. This section of the Handbook describes a possible engineering design for a SmartHub system, one that specifies presently feasible choices of hardware / software technologies and standards most likely to address the needs of first responders and incident managers. A Protocol Stack This section describes the choices of information exchange protocol standards to be implemented in each layer of the SmartHub system protocol stack in order to ensure interoperability both between modules and with external systems, from the wire / wireless connection level up to human-application interactions. There are lines of operation that can be traced vertically through the entire stack, but layer independence means that voice messages, for example, can be exchanged with the outside world through various connection protocols and in turn support human interaction through audio, text, haptic output, or other means. Figure 4: Detailed protocol stack for SmartHub system interactions 1. Connection protocol layer This layer comprises protocols implemented specifically by Sensor Modules, HIDs, Power Module, Location Module, and/or CommsHub to connect. All five modules can connect with the SmartHub through USB-C wired connections, which support both electrical power provision and a wide variety of gateway protocols on top of the basic serial connection protocol. Sensor Modules, Location Modules, and HIDs may alternately connect via Bluetooth LE for greater deployment flexibility. BLE supports essentially the same gateway protocols but does not provision electrical power. In these instances, these will need to be self-powered and support	No change made. New proposed section. Major restructuring of the handbook will be deferred to next revision cycle.
252	3	20	III.A		change blank heading 2 to normal text, just before section III.B	No change made. Appears corrected in 508 version.
337	3	43	IV.A	10	Important to explain that EDXL DE is the off-body language for "back office" communications among application servers (e.g., situational awareness, CAD, collaboration, GIS, etc.).. This section could also be condensed to eliminate unnecessary information.	Accepted. Agency / Inter-agency Interface Specification will be new heading of Section IV. Rewriting introduction to reflect that EDXL and NIEM are used to standardize server to server communications but that a lighter weight messaging scheme will be utilized for on-body to agency communications.
338	3	47	IV.B.1	1	Ditto for NIEM.	Accepted. Agency / Inter-agency Interface Specification will be new heading of Section IV. Rewriting introduction to reflect that EDXL and NIEM are used to standardize server to server communications but that a lighter weight messaging scheme will be utilized for on-body to agency communications.
267	3	48	VI.B		moved EDXL/NIEM to data model section in Engineering design	No change made. Will remain as presently located. The move to the new section will be considered for a future Handbook update.
339	3	49	IV.C	1	This section needs to be revised to explain that SmartHub messaging does not include EDXL DE. The decision has not been made that SmartHub messaging will include EDXL CAP, we may identify a more "lightweight" alerting data format.	Accepted. Agency / Inter-agency Interface Specification will be new heading of Section IV. Rewriting introduction to reflect that EDXL and NIEM are used to standardize server to server communications but that a lighter weight messaging scheme will be utilized for on-body to agency communications.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
251	3	50	III.D	26	Added new section on degraded network comms - Throughput on the LMR network is the limiting factor on how much information could be sent from an NGFR SmartHub. The LMR network is typically a 9600-baud network, which equates to approximately ~1K of data per second over the network. When LMR is the only communication channel available, machine to machine data sharing is greatly impacted and reduced, as voice communication is the priority on that network. Additionally, other communication channels, such as Wi-Fi or LTE, may experience network degradation from time to time. The full bandwidth on these channels will not always be available. 1. Atomization Approach "Atomize: to break up into small units" – Oxford Dictionary When analyzing the current data standards in terms of static and dynamic data, it becomes readily apparent that a significant portion of the information is static in nature. This observation implies that once a system has received a complete message, the majority of data elements in that subsequent messages remain the same. This finding can be leveraged to reduce network bandwidth requirements after the initial complete messages have been transmitted, which will aid information sharing on constrained/degraded communication networks. Once a complete message (template message) has been generated and exchanged across a network, the static data elements can be preserved. Future messages can be "atomized" so only the dynamic data elements will need to be sent across the network thereafter. The stored static data elements can be used in conjunction with the dynamic data elements to construct a complete message on other side of the network. 2. SmartHub Atomization Interactions It is envisioned that after starting up, but before sending any messages upstream, the SmartHub would query its upstream system to determine if it supports atomization. If the	No change made. With only 15 months remaining on the NGFR program an entirely new construct cannot be introduced.
340	3	50	IV.C.2	9ff	Ensure transport layer, application layer and encoding descriptions are accurate.	Accepted. Amended partially to reflect current thinking. This may continue to evolve.
35	3	51		2	Suggest revising line 2 and 3 to read: Techniques to mitigate commercial cellular network congestion during major events should be considered. A deployable private network can ensure local LTE local services to First Responders, and free up the backhaul link for essential data communications.	No change made. Probably out of scope for Handbook. This would fall into a different category of event planning.
341	3	78	App C	all	Add introductory text to explain that the requirements were used as a basis for development of the Handbook and are provided as background material for vendors, developers, etc.	Accepted. Added introductory text to Appendix C
87	3	103		Table 55	Shall meet requirements in NFPA 1971, 1981, 1986, 1951, 1991, 1992, 1994, 1975. Should match design, performance, testing requirements in those standards.	Accepted. Edited with proposed change
88	3	105		Table 56	Shall meet requirements in NFPA 1971, 1981, 1986, 1951, 1991, 1992, 1994, 1975. Should match design, performance, testing requirements in those standards.	Accepted. Edited with proposed change
89	3	107		Table 57	Shall meet requirements in NFPA 1971, 1981, 1986, 1951, 1991, 1992, 1994, 1975. Should match design, performance, testing requirements in those standards.	Accepted. Edited with proposed change
33	3	140			Data display requirements posit use of HUD. HUDs, including HUD alerts, can create issues. It's been recommended in some cases that data be represented in non-visual ways such as using directional audio or kinesthetic interface so that the responder's senses are either not encumbered or so that the important elements intended for display become more salient and usable within the situation. Change Add to device names in all rows: directional audio or kinesthetic	No change made. Operational training and evaluation protocols will need to be developed to assess the efficacy of the implementation. This is well understood in the responder community. Additional capabilities will be carefully vetted as to not disturb operations that could impair responder safety. Will need to be part of HSI testing guidelines.
34	3	148			Data layer requirements are based on visual interfaces. Other interfaces that do not rely on use of sight need to be considered here to ensure task/sensory loading is appropriate given the situation. Change: add to name column: data presentation mechanisms that are appropriate for the task, task and sensory loading, and situation	No change made. Operational training and evaluation protocols will need to be developed to assess the efficacy of the implementation. This is well understood in the responder community. Additional capabilities will be carefully vetted as to not disturb operations that could impair responder safety. Will need to be part of HSI testing guidelines.
90	3	152		Table 73	Similar but not same requirements as in NFPA 950. Seek to integrate.	Added text reflecting consideration of NFPA 950 for use in compliance testing.
266	3	45, 46	IV		moved diagrams as appropriate from external interfaces	No change made.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
68	3		2.F Power Module		To: Most power will be provisioned directly to other modules by various wired connections, including Universal Serial Bus (USB), and mini-USB. 110v hardware should be supported by plug standards NEMA 1-15 Type A and Type B.	No change made. This can be touched on, but is not part of the on-body suite per se.
91	3		APP C	Part C	Has similar characteristics to NFPA 1221 and PSAPs. Also, this section discusses data exchange of different types of data, similar to NFPA 950, 951 throughout.	Accepted. Added appropriate references.
92	3		APP C	Part H	Include alarm reporting requirements from NFPA 1221.	Accepted. Added appropriate references.
93	3		APP C	Table 45	Suggest the DHS Handbook does not interfere with or alter certification for NFPA 1971, 1981, 1986, 1951, 1991, 1992, 1994, 1975 compliant protective ensembles. NFPA has a definition for accessories that may be fitting here.	Accepted. Added appropriate text.
69	3		Appendix B		The Disclaimer of Liability at the beginning of Part 1, 2 and 3 states that the Handbook "does not contain or infer any official requirements". The title of Appendix B in Part 3 is "NGFR Next Generation First Responder (NGFR) Requirements" stating they are requirements. We recommend renaming them "NGFR Next Generation First Responder (NGFR) Specifications" to avoid conflict with the Disclaimer of Liability statement.	No change made. Need to confirm language with Counsel office on language used. The requirements are for the NGFR Apex Program, not the handbook. They are provided to guide readers as to the foundation for the handbook specifications.
70	3		Appendix C		Appendix C not referenced in the body of the document.	Added explanatory text. See comment 341
288	1	13	II.B	3	Figure 2. Are we retaining PAN, IAN and WAN designations.	No change made. The Personal, Incident and Wide Area Networks remain viable concepts.
71	1, 2, 3		ToC		Verify table of contents updated in final version of document.	Table updated.
72	1, 2, 3		Unk		Standardize and publish in a single list, a short definition of each major architecture term to minimize confusion and improve understanding of NGFR architecture. Include in the Handbook. For example: SmartHub, Controller Module, Communications Hub, Communications Hub Module, Sensor Hub, Sensor Hub Catalog, Hybrid Module.	No change made. Addressed in Part 1 of Handbook.
289	2	10	II.H	2-5	Should probably be revised to reflect information assigned by agency according to role.	Made recommended change.
290	2	10	II.J		Change to Cybersecurity overview. Make present J, K, L, & M subsections of new J.	Made recommended change.
277	2	10	III.J	12	Rather than try to identify specific requirements for the NGFR On-Body ensemble of equipment, the following links are provided to help agencies assess their cybersecurity requirements as applicable to the types of equipment they will plan to deploy.	Made recommended change.
278	2	10	III.J	12	It is understood that different agencies will have different levels of cybersecurity implemented in their agency networks. There are tools for assessing agency's level of cybersecurity effectiveness included in the following references.	Made recommended change.
279	2	10	III.J	12	Areas that are going to be particularly critical to NGFR On-Body suite are, in no particular order, the following: Identity, Credential, and Access Management (ICAM), Mobile Application Management (MAM), and Mobile Device Management (MDM). In addition, encrypted communications will need to be in place throughout to prevent bad actors from intercepting agency communications.	Did not add at this time, did not match sections explained in text.
280	2	10	III.J	12	These areas will potentially be addressed by the LTE service providers but this will need to be explored when planning for deployment of the NGFR On-body suite.	No change made. LTE service provider information not included in handbook at this time.
281	2	10	III.J	12	US-CERT, Critical Infrastructure Cyber Community Voluntary Program, https://www.us-cert.gov/c	Made recommended change.
282	2	10	III.J	12	US-CERT, Cybersecurity Framework, https://www.us-cert.gov/ccubedvp/cybersecurity-framewor	Made recommended change.
283	2	10	III.J	12	US-CERT, Resources for State, Local, Tribal, and Territorial (SLTT) Governments, https://www.us-c	Made recommended change.
284	2	10	III.J	12	NIST, Cybersecurity Framework, https://www.nist.gov/cyberframework	Made recommended change.
285	2	10	III.J	12	DHS, https://www.dhs.gov/publication/csd-mobile-device-security-study	Made recommended change.
286	2	10	III.J	12	DHS, https://www.dhs.gov/publication/mobile-device-security	Made recommended change.
287	2	10	III.J	12	DHS, https://www.dhs.gov/publication/csd-mobile-app-security-study-first-responders	Made recommended change.
291	2	13	III.C	33	You should add a blurb stating that vendor should provide device app with standard API to facilitate integration with SensorHub or MQTT broker SW.	Text removed, architecture and general descriptions of modules contained in Part 1
292	2	13	III.C	35	Add additional sensors to align with PR4 sensor list.	Text removed, architecture and general descriptions of modules contained in Part 1
293	2	14	III.E	30	Should the concept of a wiring harness be introduced here?	Text removed, architecture and general descriptions of modules contained in Part 1
294	2	15	III.F	6	Is figure 4 too reflective of a single implementation approach?	Text removed, architecture and general descriptions of modules contained in Part 1
295	2	15	III.G	14	Should JSON and XML be added to align with MQTT more closely?	Made recommended change.
296	2	16	III.H.1	5	May want to reevaluate this list in terms of current thinking regarding data flows.	No change made. List applicable for current architecture.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
297	2	26	IV.A.11,12,13		May want to scrutinize user language in these sections.	Handbook changed throughout to indicate access to configuration changes based upon permissions
73	2, 3		Part 2 Section 5.E.1-4 Part 3 Section 3.A-E		The section headings are structured one way in Part 2 (i.e. Controller Module-Input/Output Interface) and reversed in Part 3 (i.e. I/O Module-Controller Module Interfaces). Recommend using consistent heading structure.	Sections realigned and placed in Part 1.
74	2, 3		Part 2 Section 4.H.2 Part 3 Appendix G		Standardize use of Human-Computer Interface (HCI) or Human Systems Integration (HSI). Part 2 Section 4.H.2 refers to HCI, but Part 3 Appendix G refers to HSI.	Accept. HCI changed to HSI throughout document.
75	2, 3				Change parts 1, 2, and 3 to be: - Part 1 – Remains the same- - Part 2 – NGFR Guide: Functional (technical details moved to Part 3) - Part 3 – NGFR Guide: Technical	No change made. Will be consider in next major revision of Handbook.
76	2, 3				Realign sections to match: Introductory paragraph in Part 2 references 5 basic modules and In Part 3 references 6 modules.	Sections realigned and placed in Part 1.
299	3	9	II.C	32	May want to make sensor module types more complete.	No change made. Handbook not intended to address the full range of possible sensors
300	3	12	II.G	11	Is this too prescriptive for framework guidance?	No change made. Detail at acceptable level. Matches rest of Part 3.
298	3	43	IV.A,B,C		We may want to describe this as agency to agency communications.	Accepted. Agency / Inter-agency Interface Specification will be new heading of Section IV. Rewriting introduction to reflect that EDXL and NIEM are used to standardize server to server communications but that a lighter weight messaging scheme will be utilized for on-body to agency communications.
301	3	49	IV.C	11	Do we need to revise Table 37 to reflect are step away from XML as data format.	Accepted. Table deleted for now. Will be updated in future release.
302	3	50	V	27	This seems to be ConOps. Does it stay or go?	No change made. May be added to a future ConOps document.
77	3?		unk		Add section addressing robust networks, possibly use of mesh networks. See Geocent doc Section 4.1 Disruption Tolerant Network	No change made. Out of on-body scope.
78	3?		unk		Add information on battery performance. See Geocent doc Section 4.2 Power Consumption and Impact on Battery Charge	No change made. No activities in this level of integration testing. No task owner for this activity
79	3?				Incorporating Smart City sensors into the handbook. See Geocent doc 4.4 Leveraging Smart City Sensors	No change made. Out of scope. Agency level
80	3?				Document Roles and Responsibilities. See Geocent doc 4.5 Roles and Responsibilities in a Disparate System	No change made. May update next update cycle. As of today we haven't evaluated harnesses for use. There may be a variety of connector solutions possible so specifying a single connector type may be too prescriptive.
81	3?				Security. See Geocent doc 4.6 Security	No change made. High level guidance can be provided but can't be mandated in Handbook. Agency level implementation.
82	3?				Enterprise. See Geocent doc 4.7 Enterprise	No change made. Out of scope
83	3?				Data Management. See Geocent doc 4.8 NGFR Incident Data Storage and Usage	No change made. Out of scope
84	3?				HSI. See Geocent doc 4.9 Human-Machine Interface (HSI)	No change made. An operational evaluation plan will have to be developed to assess HSI factors in operational scenarios.
238	General				Requirements for physical connections steers towards M-PHY or some other form of data/power bus	No change made. Within-module connections will be determined by individual vendors.
239	General				All devices should have troubleshooting and diagnostic capabilities/reporting, along with visual identification of proper pairing along with configurable LED flashing sequence (recommend all devices have one multicolored LED). Press the button on the display, all flash at the same time the same pattern and color. Verifies proper pairing and communication.	No change made. Will be determined by vendor/
240	General				Accurate timing, along with timestamp. Data may be used in court of law, need integrity chain (including any store and forward data	No change made. Agencies systems use specific time sync services, we do not plan to dictate which service they should use.
241	General				Storage requirements, video formats?	No change made. These depend upon the sensor implementations and are too varied to address in the handbook.
242	General				Solicited versus unsolicited messages	No change made. All messaging within the system(s) are assumed to be internal and official.

No.	Part	Page #	Section	Line #	Proposed Change [including recommended language]	Adjudication
243	General				Clear definitions of optional versus mandatory	No change made. Handbook is guidance, cannot mandate standards - no authority.
244	General				Testing/Certification and compliance?	No change made. Testing and certification will be provided under separate guidance once the policies and processes are determined.
245	General				Logical/functional organization	No change made. Handbook may undergo reorganization as part of a future revision effort.
246	General				Backend - how do I know which interface to use to route audio and information if I'm a dispatcher?	No change made. Dispatcher will use same pathways as now, Comms Hub will route received audio/data to Responder's I/O device(s)
247	General				What is the 30 minutes of power trying to achieve?	No change made. Provide power to individual devices during battery swap
248	General				So many various IoT standards	Noted. No change made.
249	General				Security https://csrc.nist.gov/CSRC/media/Publications/nistir/8200/draft/documents/nistir8200-draft.pdf#page183 especially Page 53	No change made. Security section(s) to be updated based upon ICAM guidance, probably for the next edition.
85					Add information on aids for Developers. See Geocent doc Section 4.3 Developer Aids	Noted. No change made, developer aids may be included in a future "Implementation Guide".