1. **Scope as stated in the Standard:**

   This document specifies the DNP3 protocol structure, functions, and application alternatives. In addition to defining the structure and operation of DNP3, the standard defines three application levels that are interoperable. The simplest application is for low-cost distribution feeder devices, and the most complex is for full-featured master stations. The intermediate application level is for substation and other intermediate devices. The protocol is suitable for operation on a variety of communication media consistent with the makeup of most electric power communication systems.

2. **Purpose as stated in the Standard:**

   The purpose of this standard is to document and make available the specifications for the DNP3\(^1\) protocol. While a primary focus of this protocol is the Electric Utility Industry, other industries that deliver Energy and Water are also using DNP3. The intent of this DNP3 standard is to meet the goal established by the National Institute of Standards and Technology (NIST) for a Smart Grid protocol:
   - Provides a protocol standard from a recognized standard institution
   - Provides interoperability with hundreds of operational systems and thousands of devices
   - Provides cyber security based on IEC/TS 62351-5\(^2\)
   - Provides Device data profiles in a format that can be mapped to IEC 61850 Object Models

   Vendors may use this standard to implement and test the protocol in their products and be assured of interoperability. Users may use the document to specify the features they wish to apply. System Integrators may use this standard to assist in system integration and testing.

(*) Notes:

1. DNP3 documents developed and maintained by the Technical Committee of the DNP User Group.
2. This standard includes the Secure Authentication specification version 2.0.
3. *Are the scope and purpose aligned with the actual standard?*

Yes

4. **SGAC team summary of purpose and scope**

IEEE Std 1815™ – 2010 specifies the DNP3 protocol structure, functions, and application alternatives. In addition to defining the structure and operation of DNP3, the standard defines three application levels (Application Layer, Transport Function and Data Link Layer).

5. **What Conceptual Model Domains are affected:**

<table>
<thead>
<tr>
<th>Markets</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations</td>
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</tr>
<tr>
<td>Service Providers</td>
<td>X</td>
</tr>
<tr>
<td>Bulk Generation</td>
<td>X</td>
</tr>
<tr>
<td>Transmission</td>
<td>X</td>
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<tr>
<td>Distribution</td>
<td>X</td>
</tr>
<tr>
<td>Customer</td>
<td></td>
</tr>
</tbody>
</table>

6. **What Levels in the ISO 7 Layer Model and/or the GWAC Stack are affected by the standard?**

<table>
<thead>
<tr>
<th>Application</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Presentation</td>
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</tr>
<tr>
<td>Network</td>
<td></td>
</tr>
<tr>
<td>Data Link</td>
<td>X</td>
</tr>
<tr>
<td>Physical</td>
<td></td>
</tr>
</tbody>
</table>
This standard addresses the following GWAC Levels (Interoperability Categories):

- Level 3: Syntactic Interoperability (OSI layers 5-7)
- Level 2: Network Interoperability (OSI layers 3-4)
- Level 1: Basic Connectivity (OSI layers 1-2)

7. If the standard addresses multiple layers... Why? Is there effective separation of layers (in the ISO or GWAC stack)? Is there a plan to migrate to single layer standard?

The designers of DNP3 gave themselves a design goal to minimize bandwidth and use as few layers as possible while at the same time remaining as compliant at these layers with IEC 60870-5. Therefore the transport layer is actually a transport function that provides a header that is separate from the data link layer yet is not a complete transport layer. Transport function also supports breaking application layer data into small segments for passing over noisy links.

For networking applications the same (as serial) DNP3 Application Layer, Transport Function, and Data Link Layer structures, objects, and formats are used. Thus, DNP3 Data Link Layer frames are passed transparently across an IP network as TCP or User Datagram Protocol (UDP) packets.

Separation of layers is not considered in this standard; and there are no plans to migrate to a single layer standard.
8. How would technology based on the standard be used in applications in the future? Adapted to today’s applications?

This standard will be used to deploy new technologies where the attributes of this standard are favorable. However, other new technologies will benefit from using IEC 61850 which provides a broader set of functions, services and standard model definitions.

9. Is there a migration path from current use in the area of the standard to this standard?

A mapping specification is being developed (IEEE P1815.1) for the purpose of mapping between devices and systems supporting this standard and those supporting IEC 61850.

10. Does this standard affect any other PAP (if yes, list)?

Not directly.

11. Has this cross PAP effect been discussed by the SGAC evaluation team?

Not applicable

12. What action items resulted from team discussions?

<table>
<thead>
<tr>
<th>Action Item</th>
<th>Assigned to</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>None</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

(Add rows as needed)

13. If there are use cases related to the standard, are the use cases and the standard aligned? Are these current/past use cases? Are they white box/black box? Are there future use cases or requirements?

Limited use cases described in the standard focus on using and exchanging XML representations of DNP3 device profiles.

14. If there are use cases, are they candidates for the Conceptual Architecture – Requirements Document? If not present, what new requirements may need to be added?

No, this specification is for a communication protocol and therefore does not introduce new use cases or requirements.

15. Is the terminology reasonably understandable by the intended audience? Is the terminology consistent through the document? Are standard dictionary(ies) referenced normatively?


16. If UML class or other diagrams are useful for understanding the standard, are they available or used in the standard?

Diagrams are used extensively in the standard.

17. Does the standard include transitional artifacts? If so, are the transitional artifacts necessary to support legacy applications? Can they ever go away?

Yes, some transitional artifacts are included such as subset levels and options for serial or network implementations. It is doubtful that these will go away in the foreseeable future.

18. Are there things in the standard that have no obvious purpose in the use of the standard? Why do we think they’re there? Are those things supporting evolution of application architectures?

The Introduction discusses the history, intent and evolution of DNP3. While some readers of the standard would find this of value, individuals who are already knowledgeable of DNP3 may find this information superfluous. As a result, some of the content of the introduction may be viewed as optional and could be removed in future versions.

19. This standard is:  G, A (This is the next iteration of a well established standard)

A. A new standard that is being created by a new working group
B. A new standard that is being created by a new working group
C. A new standard that is being created by an established working group
D. A standard that was in draft form, but not finalized yet
E. A standard that was released but does not have a testing and conformance plan
F. A standard that is released, has a testing and conformance plan, but is undergoing a major revision
G. A standard that is mature, has testing and conformance and no major revisions are pending

20. Does this Standard limit options for innovation in the future? How? If yes, what limits are placed on innovation?

Yes, since there is a broad and well established installed base of legacy DNP3 systems and devices, care must be taken to avoid adversely affecting this large base.

21. Other Comments:
While moving forward with establishing more advanced capabilities into IEEE 1815, there should be a goal of allowing legacy systems and devices to continue to be supported by the evolving standard. In addition, future IEEE 1815 and IEC 61850 working groups should continue to refine the mapping of IEEE 1815 and IEC 61850 with the long term goal of improving the interoperability of devices and systems deployed using IEEE 1815 and IEC 61850.

22. SGAC Summary Comments:

This review scope covers the IEEE P1815-2010 standard by the SGIP SGAC. The IEEE P1815-2010 standard represents a codification of the Distributed Network Protocol 3 into a formal IEEE Standard.

The IEEE P1815.1 mapping specification, which is being developed for the purpose of mapping between IEEE 1815 (DNP3) devices and systems supporting this standard and those supporting IEC 61850, will be a significant step toward addressing bridging the gap between IEEE 1815 (DNP3) and IEC 61850. When complete, this mapping will support the industry in its efforts targeted at improving the interoperability of heterogeneous systems which desire to implement both DNP3 and IEC 61850 devices. The SGAC will separately review the IEEE P1815.1 standard when it becomes available.

The SGAC has confirmed full acceptance of the standard IEEE P1815-2010 standard.