

DoD Military GPS UE Certification Study

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“CERTIFICATION”

What Does a Word Mean?

- A “cool” car versus a “cool” reception; same word with vastly different meanings and implications
- Certification means different things to different people
 - FAA Certification denotes very specific receiver attributes related to safety-of-life
 - Receiver certification for non Safety-of-Life applications is a different animal all together
- “Certification” of GPS receivers for other than Safety-of-Life applications can mean whatever we want it to
 - i.e. “Certified” to fully comply with Interface Specification (IS) XXXX

DoD's Study in Certification

- Manufacturing advances in Global Positioning System (GPS) User Equipment (UE) development led to modular and software-based UE.
 - Resulted in supersession of DoD guidance designating the GPS Directorate as the Department lead for development and procurement of military UE.
 - Fostered new UE development and procurement guidance; DoD subsequently directed USAF to:
 - Develop an evaluation process for military GPS UE to ensure adequate performance is implemented in receiver designs.
 - Test military UE at the card or software module level against applicable GPS JPO performance specifications and document the results.

Subsequent Incidents

- Subsequent to issuance of new guidance DoD GPS customers experienced UE anomalies following planned Control Segment Upgrades
 - Investigation revealed UE vendor's misinterpretation of published interface control documents (ICDs) and failure to appreciate the significance of anticipated changes to the GPS signal-in-space
 - UE anomalies resulting from improperly applied ICD specifications has cost DoD between \$15 - \$25 million to identify and correct shortcomings

GPS Directorate Certification Study

- GPS Directorate ordered study to investigate best certification practices.
 - Examined processes of other testing & certification organizations:
 - Underwriters Laboratories (UL)
 - Institute of Electrical and Electronics Engineers (IEEE)
 - National Oceanic and Atmospheric Administration (NOAA)
 - American Society of Testing and Materials (ASTM)
 - American National Standards Institute (ANSI)
 - Federal Aviation Administration (FAA)
 - US Military Specifications (Mil Spec)
 - Numerous individual electronics manufactures
 - Resulted in recommendations for the GPS Directorate to pursue certification of ICD compliance



Options for Certification Structure

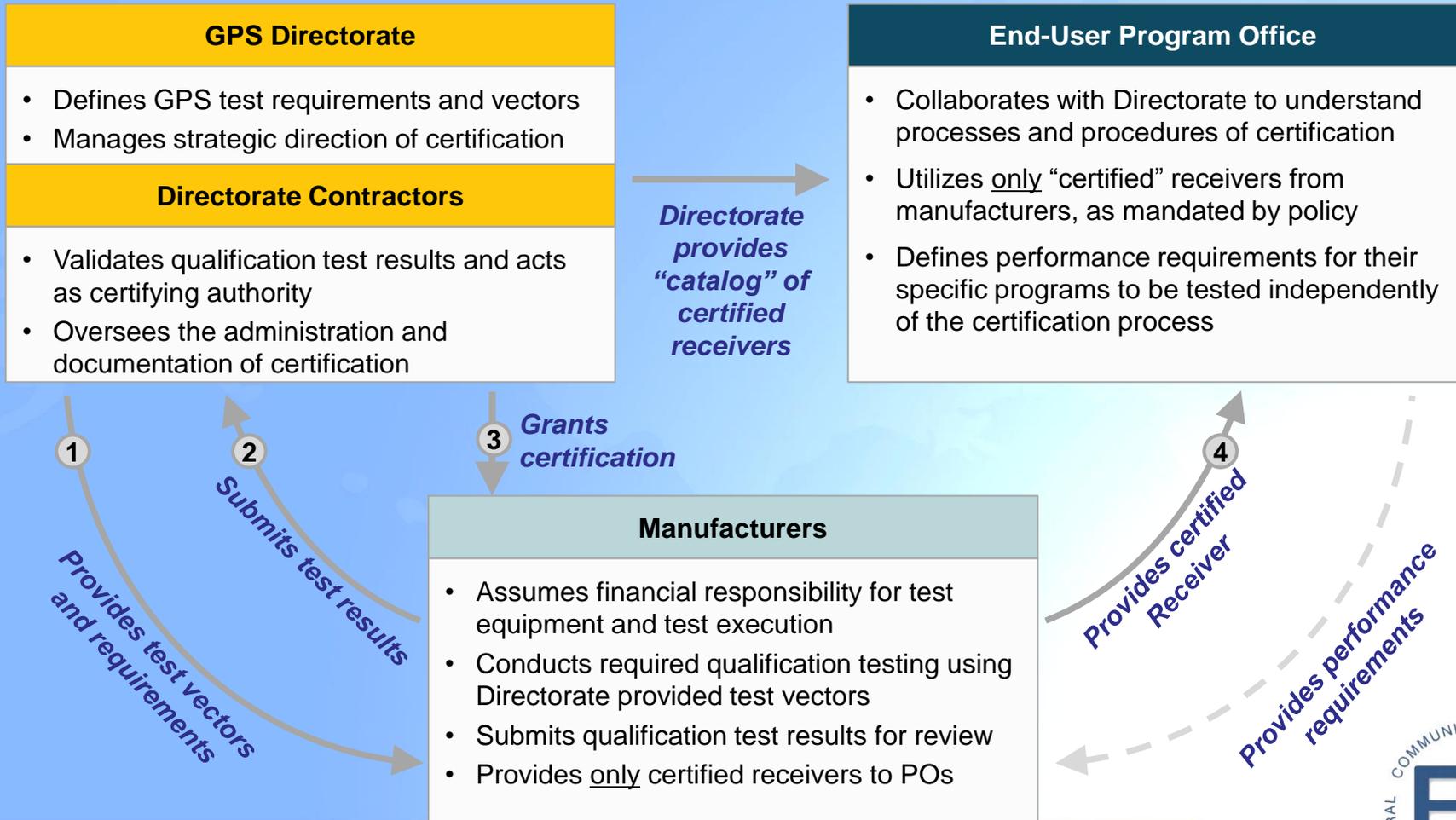
Characteristic	GPS Certification Structure								
Certification Requirement	Mandatory (new policy) <i>Voluntary (market-driven)</i>	Mandatory	Voluntary			Mandatory		Voluntary	Both
Liability Structure	Assumed by product manufacturers <i>Assumed by certification stakeholders</i>	Assumed by product manufacturers ³							
Organizations Involved	Multiple organizations <i>Single organization</i>	Single Org		Multiple Organizations					
Manufacturer Involvement	Involved in certification process <i>Independent of certification process</i>	Involved			Independent	Involved		Independent	Involved
Financial Obligation	Assumed by product manufacturers <i>Assumed by certification stakeholders</i>	Assumed by product manufacturer							Cert S/H
Standards Definition	Government agency – GPS Directorate <i>Industry consortium Standards organization</i>	Industry Consortium		Standards Organization			Gov Agency	Standards org	Gov Agency
Certification Authority	Government agency – GPS Directorate End User Program Offices Independent third-party	Independent 3 rd Party					Gov Agency	3 rd Party	Gov Agency
Testing Definition	Government agency – GPS Directorate <i>Industry consortium Independent third-party</i>	Industry Consortium			3 rd Party		Gov Agency	3 rd Party	Gov Agency
Testing Execution	Self-administered by manufacturer <i>Testing Definer Independent testing agency</i>	Self & Testing Definer	Testing Definer	3 rd Party	Self & 3 rd party administered			Random Sampling	Self Admin.
Testing Type	Certification unit / qualification testing <i>Random sampling Process / design verification</i>	Qualification Testing			N/A ¹	Random Sampling	Process Verification ²	Qual & Design	Random & Design
Scope Extent of Testing	Common standard certification (TBD) <i>Common standard, multiple tiers Application specific standard</i>	Relevant to Military GPS Receiver Certification Only							Common standard
Scope Level of Integration	Level 0 Level 1 <i>Level 2</i>	Level 0 & 1			Level 2				
Scope Generation to Test	P(Y) & M-Code <i>M-Code Only All receivers including DoD procured civilian</i>	Relevant to Military GPS Receiver Certification Only							P(Y) & M-Code
Recertification (Change in Standards)	No process <i>Formal recertification process</i>	No process							
Recertification (Change in Products)	Formal recertification process <i>No process</i>	Formal process			No process		Formal process		

3 Options for Certification Authority

- GPS Directorate
- End User Program Offices
- Third Party Organization

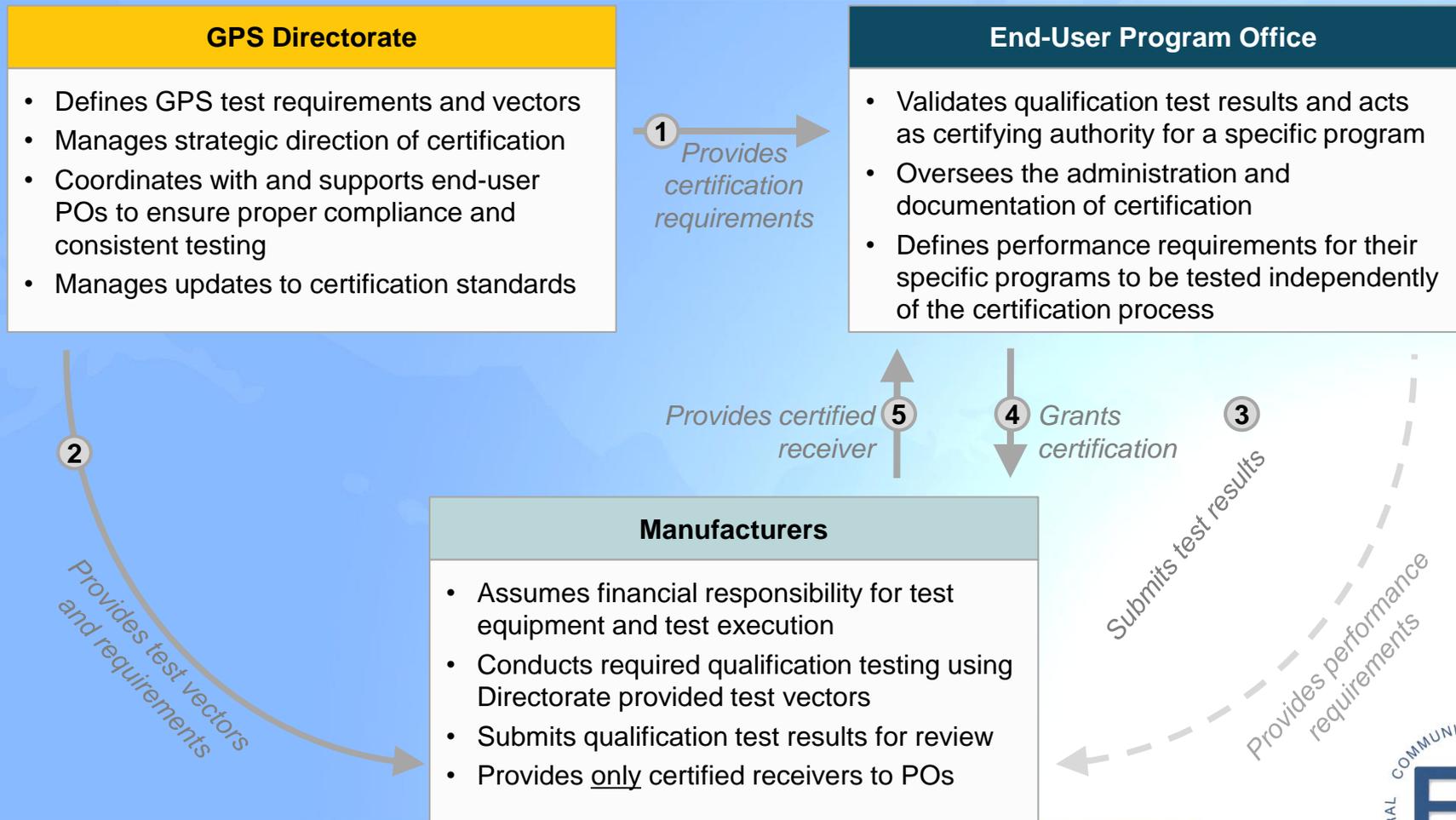
GPS Directorate

Provides a baseline certification structure where the Directorate acts as the certifying authority



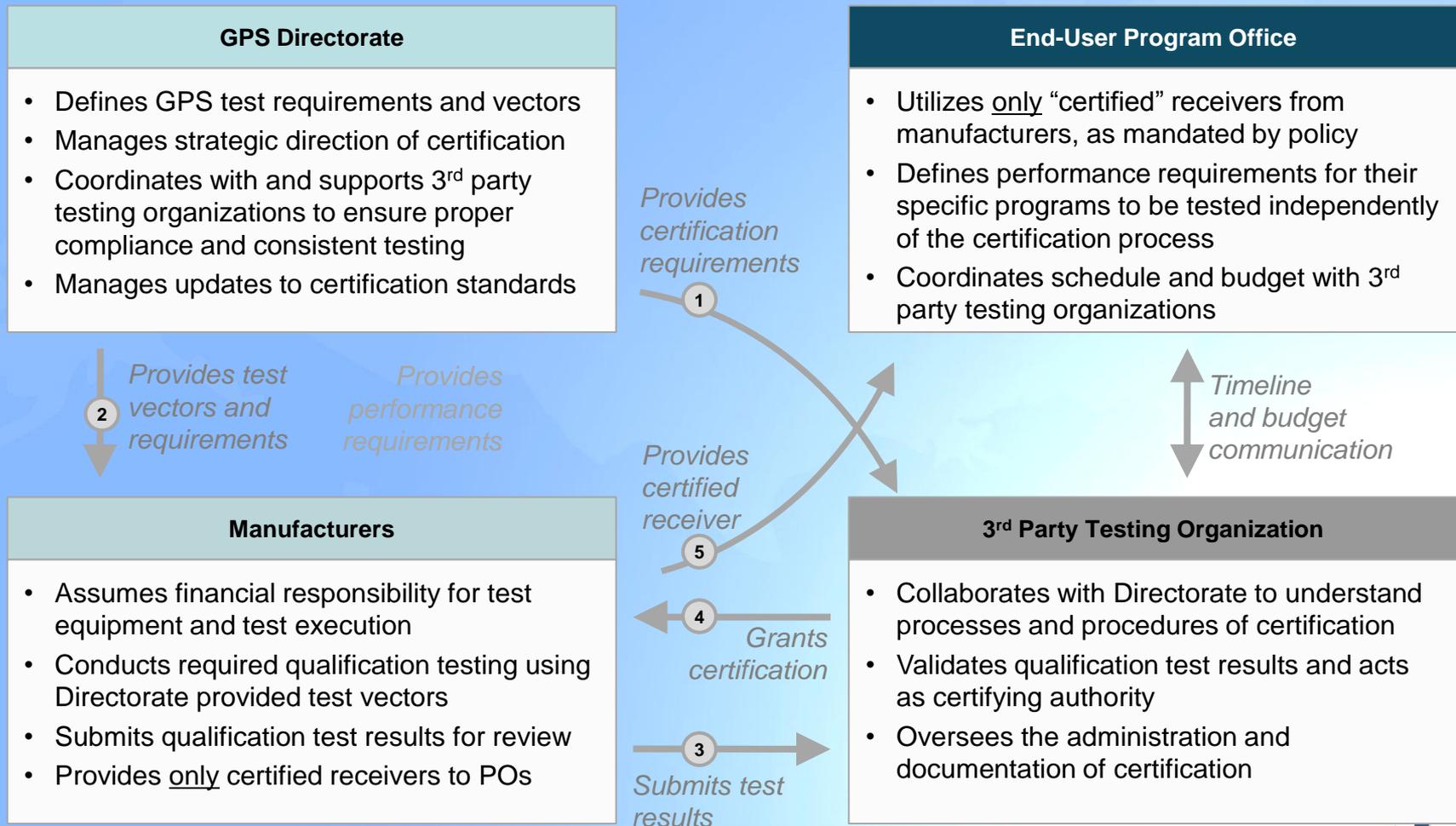
End User Program Offices

Shifts the responsibility of certification authority to the end-user POs, but the Directorate still provides test vectors and requirements to the manufacturers



Third Party Testing Organization

Gives the certification authority to a 3rd party testing organization, but the Directorate still provides test vectors and requirements to the manufacturers



Certification Authority Pros & Cons

Authority	Benefits	Challenges
<p style="text-align: center;">GPS Directorate <i>and associated contractors</i></p>	<ul style="list-style-type: none"> ● Centralized control/management improves stakeholder coordination and communication ● Facilitates closer relationships with Program Offices and manufacturers ● Reinforces the brand and reputation of the Directorate as the authority in GPS ● Ability to leverage processes and lessons-learned from existing security certification 	<ul style="list-style-type: none"> ● Requires dedicated budget to administer the certification process, which may take resources away from other Directorate responsibilities
<p style="text-align: center;">End-User Program Offices</p>	<ul style="list-style-type: none"> ● Greater stake in outcome of certification testing ● Potential to leverage existing relationships with manufacturers to streamline coordination ● Allows Directorate to focus budget and resources on other core responsibilities 	<ul style="list-style-type: none"> ● No existing authorization processes, requiring technical and procedural training ● Potential for inconsistent standards and practices across different program offices ● Potential for conflict of interest as POs look to accelerate timelines and minimize budgets ● More costly due to redundancies created by each PO administering the process ● Directorate may lose awareness and/or control over the certification process
<p style="text-align: center;">Independent Authority <i>USG test organizations and non-profits</i></p>	<ul style="list-style-type: none"> ● Familiar with technical requirements and procedures of certification ● Existing relationships with manufacturers and POs ● Allows Directorate to focus budget and resources on other core responsibilities 	<ul style="list-style-type: none"> ● No existing authorization processes, requiring technical and procedural training ● Creates an additional stakeholder (and layer of responsibility) in the process, which likely increases the overall cost ● Directorate may lose awareness and/or control over the certification process

Study Recommendation

Certification Authority

Recommendation: The **Directorate** should assume responsibility for authorizing the certification

Rationale: Most efficient structure because expertise and capability is resident in Directorate; eliminates potential conflict of interest; allows the Directorate to more effectively maintain centralized control and strategic direction of military GPS user equipment

Extent of Testing

Recommendation: The Directorate should focus on **signal-in-space functionality** by requiring manufacturers to achieve compliance with a baseline set of ICDs

Rationale: By limiting the initial phase of receiver certification to a set of tests to exercise the signal-in-space ICDs, the Directorate can effectively balance the feasibility of implementation with the avoidance of “incidents”

What it will accomplish...

- Ensures compliance with signal-in-space ICDs
- Allows the Directorate to maintain strategic direction over the certification process

... and what it won't

- Does not provide assurance of performance capabilities
- Does not ensure proper integration with external devices and/or systems

Rationale

- Executable in a feasible timeline and within a reasonable budget
- Allows Directorate to climb learning curve in a lower risk environment
- Positions certification for future enhancements or expansion to civil