IEEE P1952 – Resilient Positioning, Navigation and Timing User Equipment Working Group

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WSTS 2023

Agenda

- Critical infrastructure and GNSS
- IEEE 1952 project scope and purpose
- Process and organization
- Position, navigation and timing user equipment
- Use cases
- Threats, hazards and disruptions to PNT user equipment
- Resilience levels
- For further information

Critical Infrastructure currently dependent on GNSS

- Power Grid
- Telecommunications
- Finance
- Transportation
- Manufacturing
- Defense
- Broadcast-media

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GNSS jamming and Spoofing

- Jamming devices
  - Used by professional drivers and vehicle thieves to avoid tracking
  - Can be purchased online for as little as $10

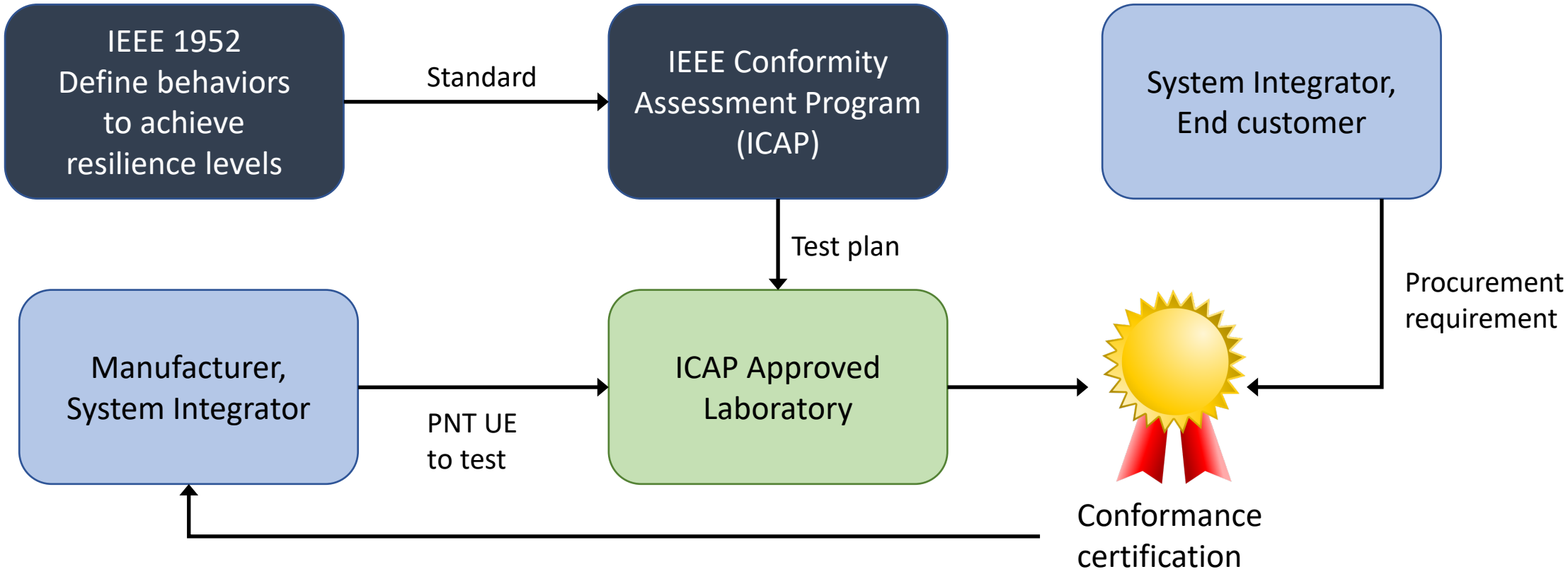
- Easy to do with software defined radios
  - SDR unit be purchased online for about $300
  - Free open source GPS spoofing software available at github

IEEE P1952 project

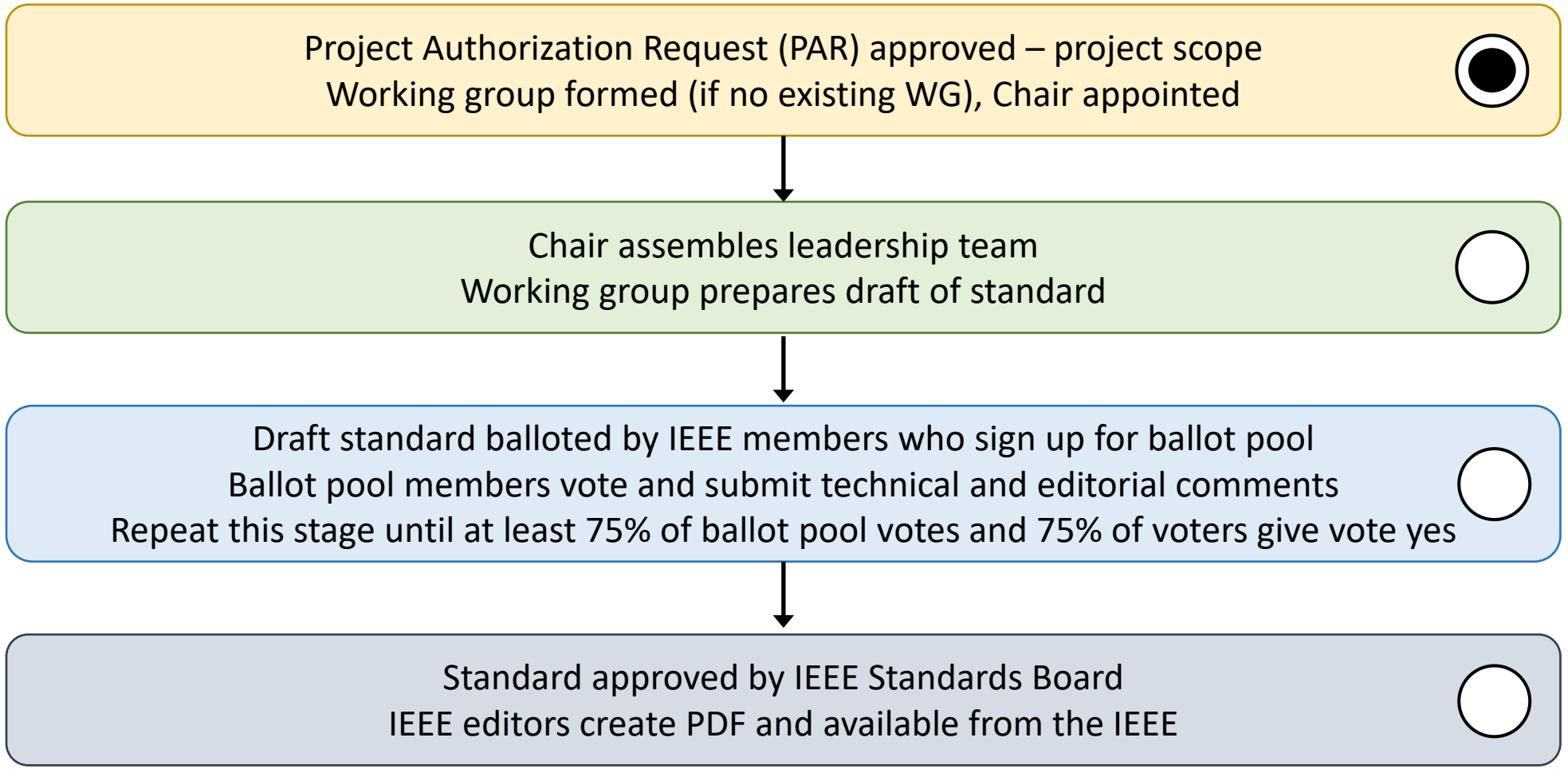
- Resilient Positioning, Navigation and Timing User Equipment Working Group
- Project to create an IEEE standard
  - Standard for Resilient Positioning, Navigation and Timing User Equipment
- **In Scope**
  - Requirements on behaviors of PNT User Equipment
  - Defines levels of resilience for PNT UE
- **Out of scope**
  - Requirements on PNT source systems (e.g. GPS)
  - UE design to achieve resilience levels

IEEE SA
STANDARDS ASSOCIATION

Vision for helping industry



IEEE standards process



IEEE P1952 Organizers

Officers

Chair: Shelby Savage (MITRE)

Vice Chair: Steve Guendert (IBM)

Secretary: Patricia Larkoski (MITRE)

- Meeting schedule and minutes,
- Working group voting rights tracking

Program manager: Jennifer Santulli (IEEE SA)

- Knowledge resource for WG on IEEE process and rules

Editor: Doug Arnold (Meinberg USA)

- Add contributions into IEEE template
- Organize comment resolution

Subgroups

Use Cases

- Chair: David Sohn (Orolia)

Threats, Hazards and Disruptions

- Co-chair: Marc Weiss (Consultant, formerly NIST)
- Co-Chair: Pat Diamond (Consultant, formerly Semtech)

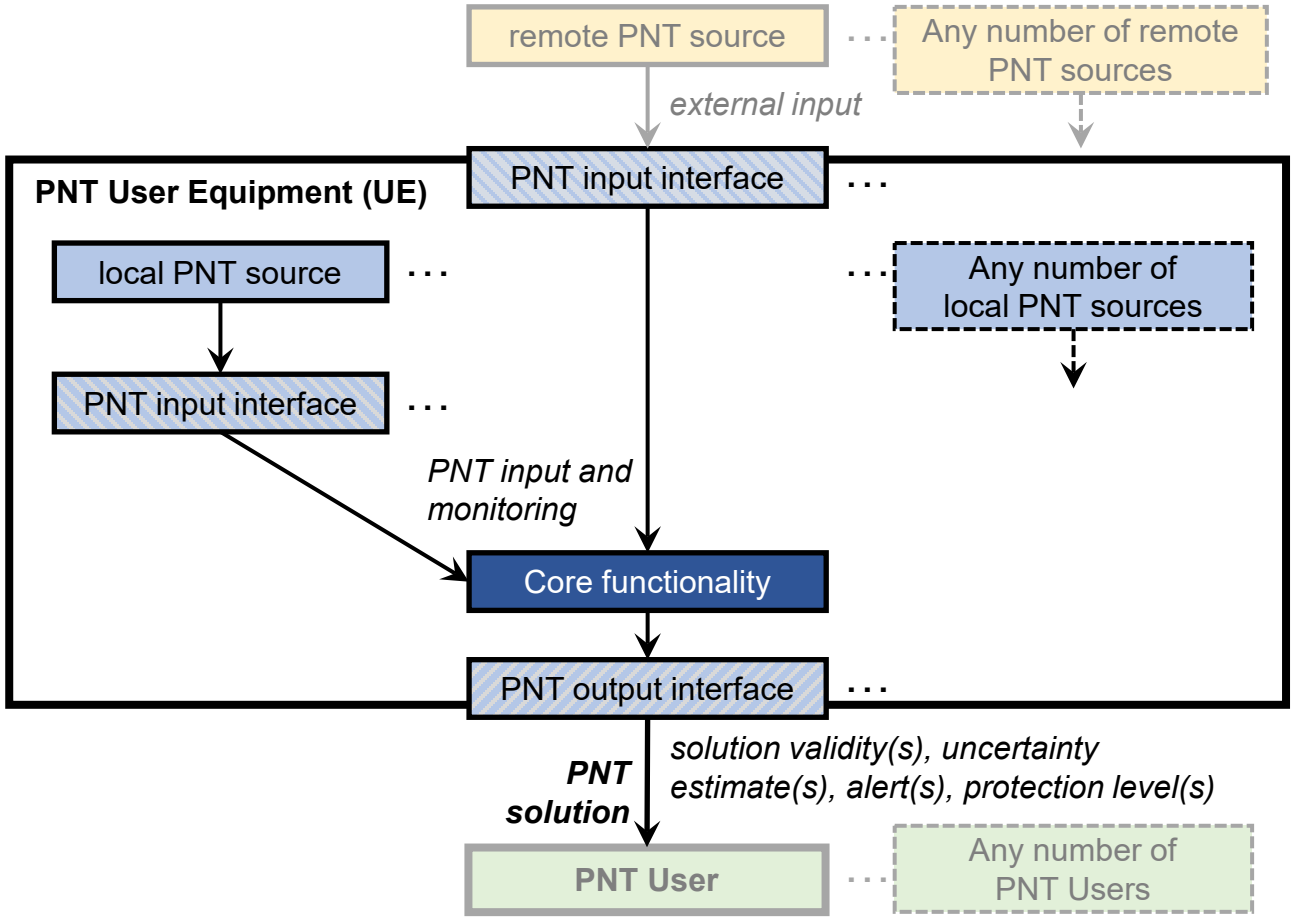
Resilience Levels

- Chair: Cristina Siebert (NextNav)

System Engineering

- Co-Chairs: Magnus Danielson (Net Insight), Mitch Narins (Strategic Synergies)

PNT User Equipment



Use Cases

diagram thanks to David Sohn

Under discussion:
Do we need a precise positioning use case?

Threats, Hazards and Disruptions

- Threats are accidental, unintentional or malicious
  - For example: GNSS spoofing
- Hazards are accidental or unintentional
  - Sub-category of threats
  - For example: effects of weather
  - For example: unintentional RF interference
- Disruptions are caused by threats
  - PNT User equipment unable to meet the requirements of the use case
- Goal of subgroup is to identify **categories** of threats that cause disruptions in PNT operation
  - Not to identify all possible threats
  - Limit the number of tests needed to prove resilience

Resilience Levels

- Based on broad definition of resilience, including:
  - Robustness
  - Integrity
  - Assurance
- Ability to withstand threats and hazards or recover from them
- PNT systems for critical infrastructure will likely need to meet higher levels of resilience
- Lower resilience levels can be useful for subsystems
  - For example, multiple lower resilient subsystems managed by a PNT source selector can achieve a higher resilience level than that of any of the subsystems

Resilience Levels

Concepts under discussion for resilience levels

- Ability to check all PNT input data for compliance with PNT source specifications
  - For example: some GPS receivers rejected 13 μs error in 2016
- Ability to detect PNT input jamming and spoofing
- Ability to resist PNT input jamming and spoofing
- Ability to maintain minimum PNT performance for a specified time interval
  - For example: oscillator holdover
  - For example: integrating accelerometer
- Ability to maintain minimum PNT performance indefinitely during threat
  - For example: using diversity of PTP sources
- Ability to verify PNT input accuracy by comparison to other PNT sources
  - For example: voting algorithms

Systems engineering Subgroup

- New subgroup just getting organized
- Expected outputs of the subgroup could include:
  - List suggested metrical variables relevant (like availability, continuity, etc.) to each resilience level
  - Assessment of resilience level requirements produced by the RLD subgroup for evaluability within the THD Subgroup's threat model
  - From high-level requirements established in the RLD subgroup, derive example low-level requirements for key use cases
  - Informational material recommending how regulators may use the P1952 standard

To find out more or become involved

https://sagroups.ieee.org/p1952/

Contains: email addresses of officers

upcoming meetings