OT, IoT, and AD Cybersecurity Landscape

Looking at operational technology, internet of things, and autonomous devices

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OT, IoT, and AD: specialized hardware + software

Mostly not incorporated into IT security systems. Increasing connectivity to IT systems

OT differences: specialized often proprietary systems, often embedded code, some with limited bandwidth & power, often owners lack ability to inspect source code

OT limited or lacking: software assurance tooling, cybersecurity monitoring, control coordination with intrusion protection systems, analyses of IT system connections impacts both ways, automated alerts when something wrong, alert monitoring, inspection, and fixes

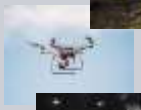
Operational Technology (OT)

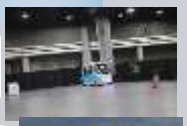
Control or sense the physical world (vs. IT systems manage data)

- Distributed control systems (e.g., power, manufacturing)
- Supervisory control and Data Acquisition Systems (SCADA, e.g., rail, pipelines)
- Buildings and Physical Access Controls (e.g., HVAC, elevators, door swipe cards)

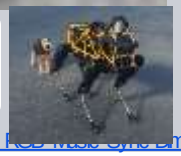
Autonomous Devices as OT

System moves and can operate without a human in the loop





- Vehicles (cars, trucks, trains)



- Robots (e.g., landmine handlers, environment discovery and manipulation, cleaners)

Internet of Things as OT

Connect things to internet to capture data and send control

- Examples: Light bulbs controllable with apps, air quality sensors

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OT, IoT, and AD: R&D Directions

The Software Engineering Institute has expertise relevant to these R&D areas.

- Software assurance (SwA) tooling and security frameworks for development and analysis
- Binary analysis and combining binary analysis with source code analysis is especially important to analyze these devices for software assurance
- Coordinated IT/OT security systems that identify systems' cybersecurity and functionality should be monitored and problems identified and addressed
- Security analyses should consider physical dangers and privacy threats. E.g., due to bugs, hacking, or built-in unwanted functionality any of the following could be issues: autonomous weapon firing, loss of critical services, fire, flooding, stalking, surveillance of journalist by a threatening government via IoT systems

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