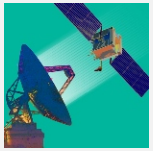
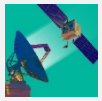


GSAW 2020
March 2-5, 2020
Renaissance Los Angeles Airport Hotel
Session 3: Development Methodologies

Is Structured Agile an Oxymoron?

Tales from Implementing and Executing Agile in a US Government Environment

Theresa Beech and Sharon Orsborne, NASA Goddard Space Flight Center, Software Engineering Division
Jay Bugenhagen, Arctic Slope Technical Services
Jay Czarnecki, Telophase Corporation



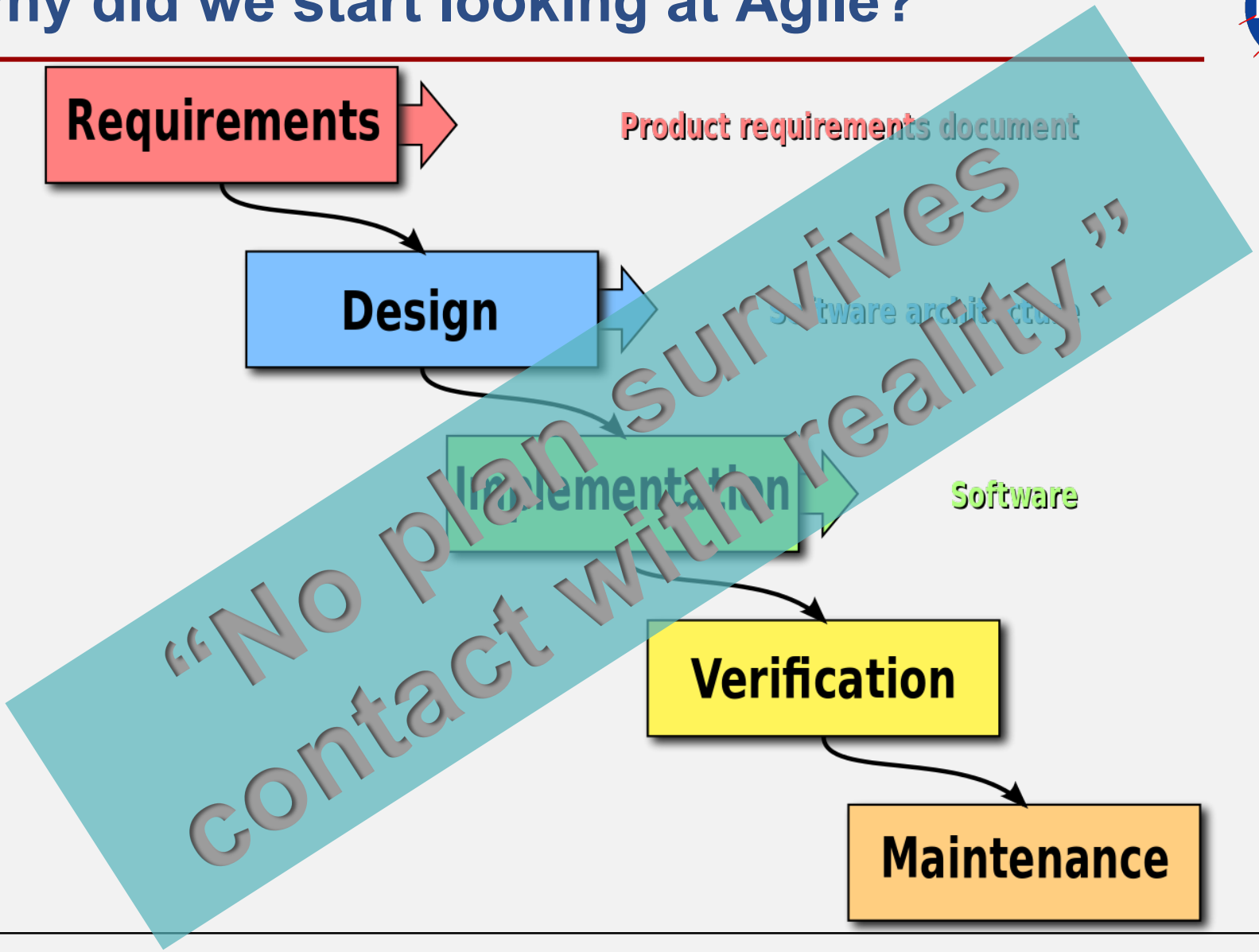
Overview of our development

- About 16/17 FTEs (~ 20 people) develop satellite ground system SW
  - Mix of civil servants and contractors
- Support dozens of satellite missions across multiple space agencies (NASA, NOAA, DoD)
- Operational since 2005
- SW is a broad spectrum of:
  - Older SW in maintenance & sustainment mode
  - SW with on-going enhancements
  - New SW mostly well-bounded
  - New SW of unknown scope/implementation
  - Class B (mission critical), C and D software

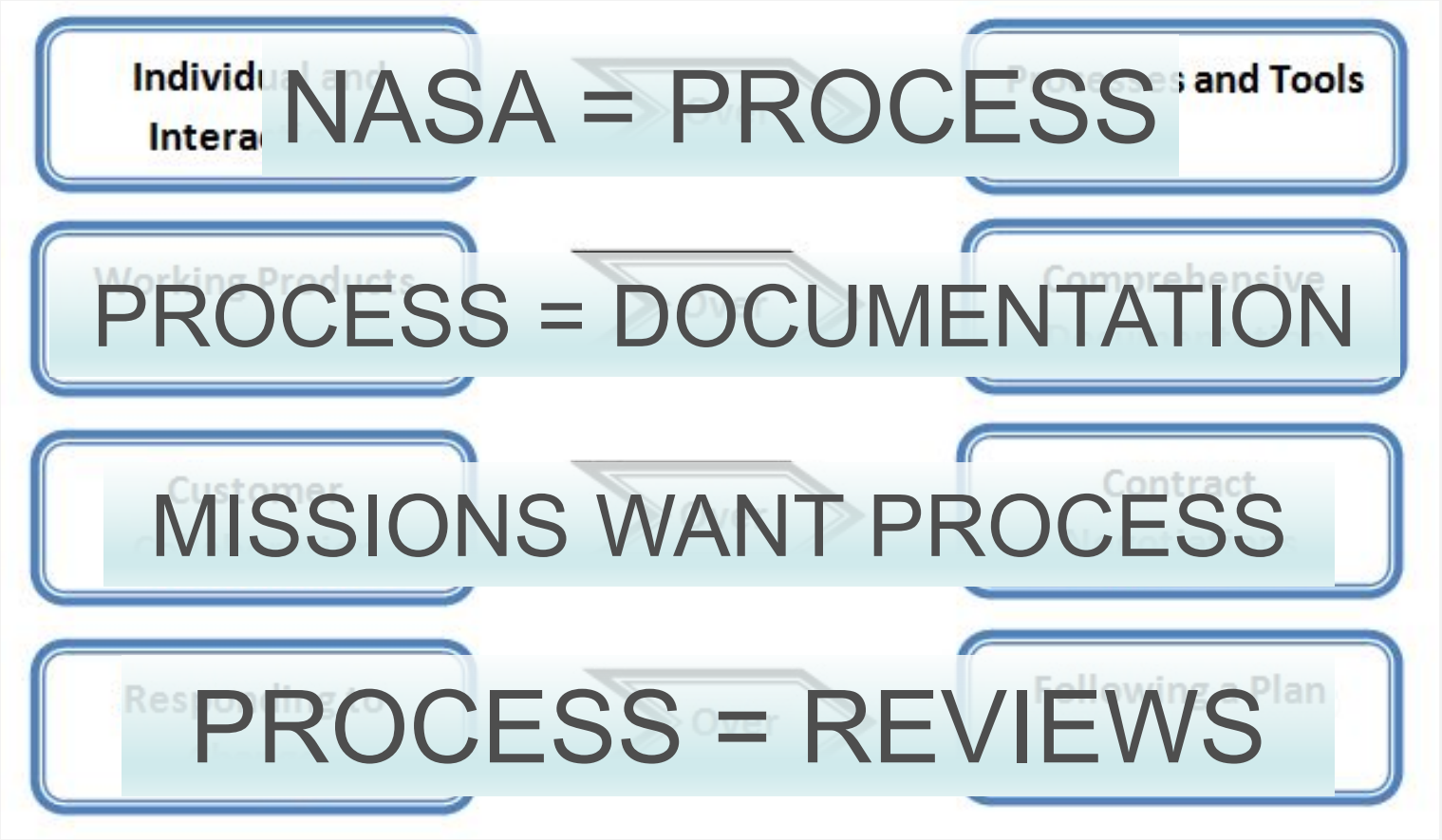
GMSEC's mini-MOC: Big Bertha

- OMG C2MS standard compliant (C2MS evolved from our message standards)
- On-going mission support
- Software technologies include:
  - C, C++, C#, Java, Python, webservices, …
  - SQL, Elasticsearch
  - Multiple middlewares: ActiveMQ, RabbitMQ, Webspheres, OpenDDS, internal (Bolt)

Why did we start looking at Agile?

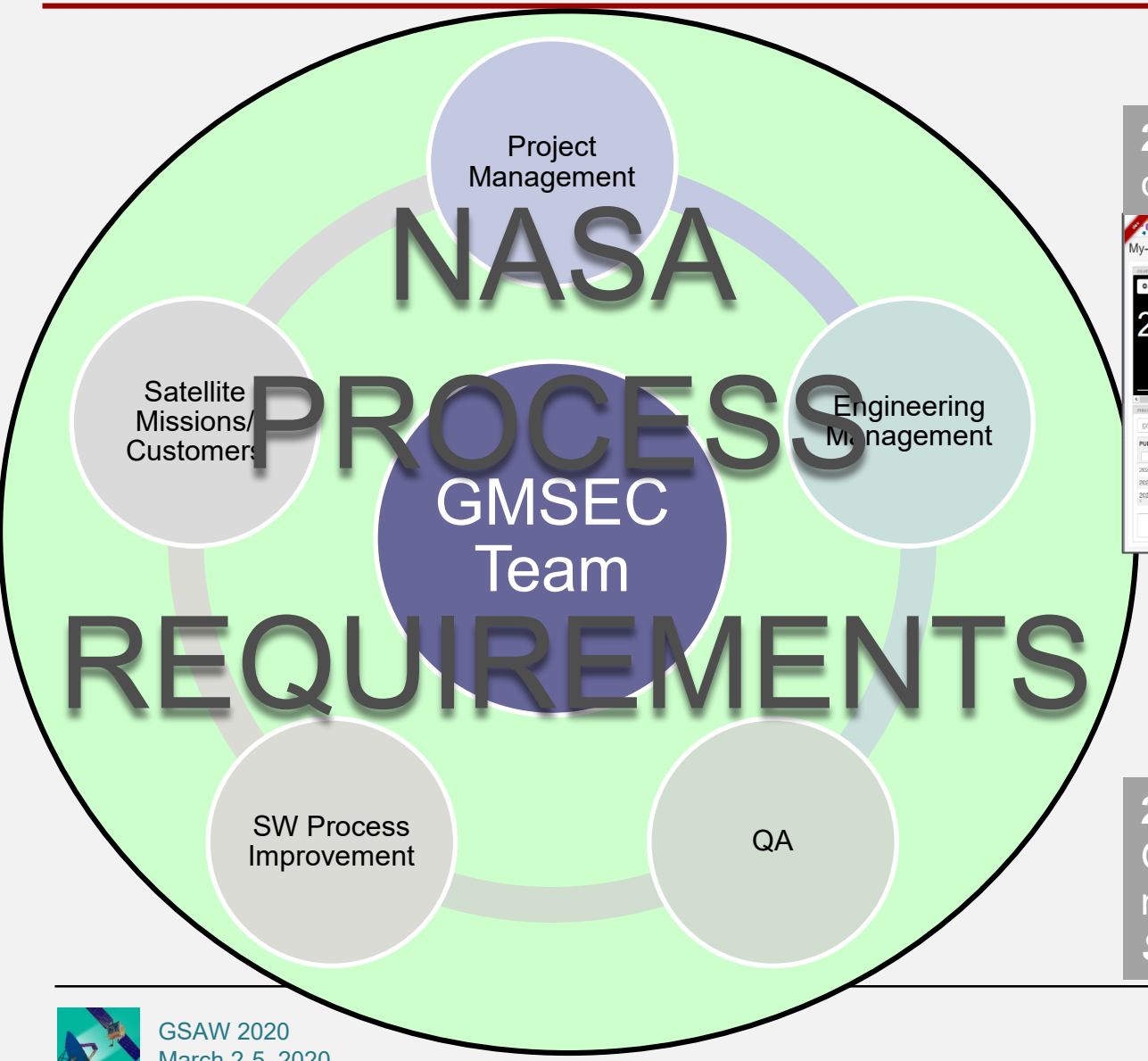


The Agile Manifesto & Our Problem Space

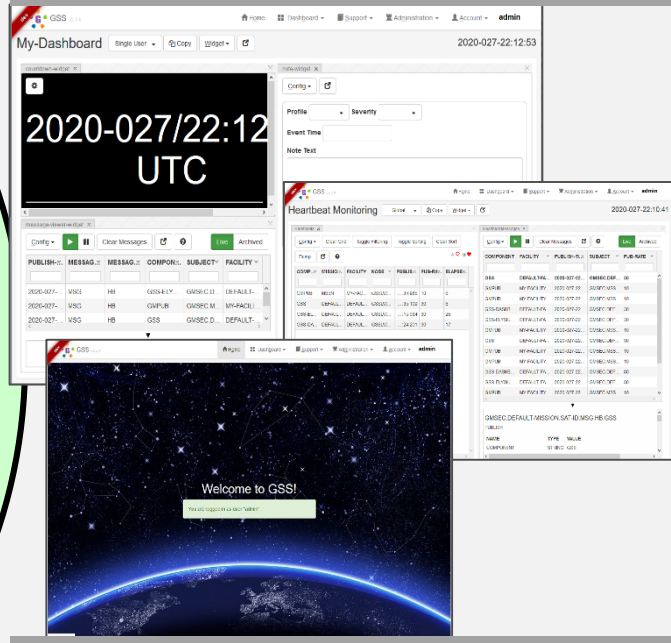


Sounds great, but how do we do this at NASA?

How did we start?
Our environment & stakeholders….



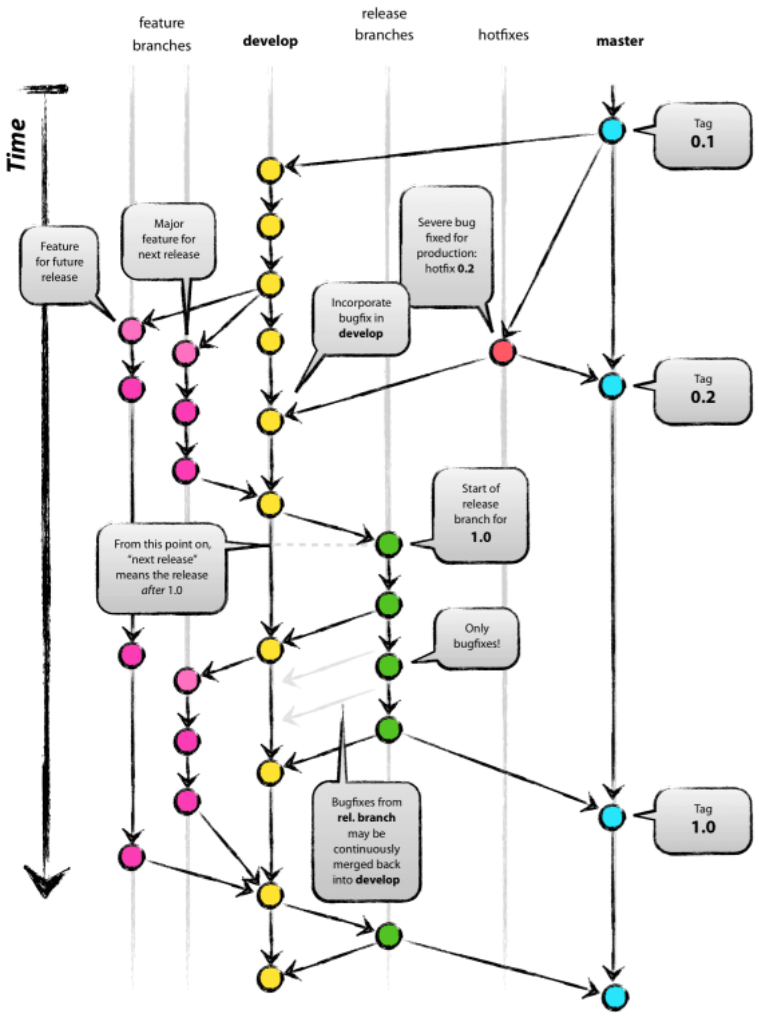
2015/6: Agile prototype of new component GSS



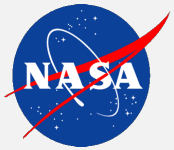
2018: Extended Agile to all GMSEC software with mods to meet NASA process reqs → ***STRUCTURED AGILE***

What have we done?

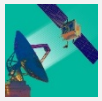
- **Structured Agile**
  - Team sub-divided into smaller teams
  - Team meetings in person + telecons
    - Monthly sprints
    - Daily stand-ups (max 15-20 mins)
    - Weekly Engineering Peer Reviews (EPR)
    - Ad hoc meetings as needed
  - **Frequent communication** with SW Process Improvement (SPI) team, management, and missions/customers
  - **Reduced formal reviews > 50%**
    - Mthly sprint mtgs substitute for some reviews
  - **Automate, automate, automate:**
    - Component testing **reduced from 15 manmonths to 1 manmonth** per release
  - **Minimize manual documentation:**
    - **> 2/3 generated automatically**
    - Standardized component test plan
  - Independent QA audits unchanged



How to tailor Agile to be more structured



- **Continuous team discussion on processes:** everyone participates
  - Process discussions occur monthly to figure out what is working, what isn't, and what we need to do to meet the NASA requirements
- **Close working relationship with the SPI Team** to understand the NASA reqs, and tailor our processes to meet it
  - Invited to all meetings except stand-ups
  - **3 reviews:** RCR, TRR and RRR
  - **Framework/tools maintain/house our QA artifact repository**
    - SW Reqs → SW tests RTM, Test Procs, & Test Reports in Robot
    - DRs and Ers logged in Jira ➔ auto-generate VDDs and readmes
    - Code review process tracked in Git at merge requests
    - Jenkins used for continuous integration testing nightly, Gradle is our build environment, Izpack is installer
    - ***Complicated to get QA buy-in***



EXAMPLE in progress: bidirectional trace

SW Reqs ⟺ SW Design ⟺ Code

- **Waterfall answer = more documentation, *lots* of documentation**
  - Not acceptable, so how to do something Agile?
- **On-going team discussions**
  - Can we ignore this? What do we want to do? From nothing to …
  - How to make it useful for us? Old vs. new developments
  - How to minimize the "check the box" cost?
  - **Heated discussions with SPI listening in**
  - Informal briefings to eng mgmt
  - Approach decided upon:
    - **Two pilot projects started:**
      - MagicDraw linked to Jira and Git
      - Javadoc and javacomments

Mission EXAMPLE: Search and Rescue (SAR) Intelligent Terminal (SAINT)

- Objective: develop a prototype for a distributed beacon tracking visualization system for use during human launch & landing

Challenges

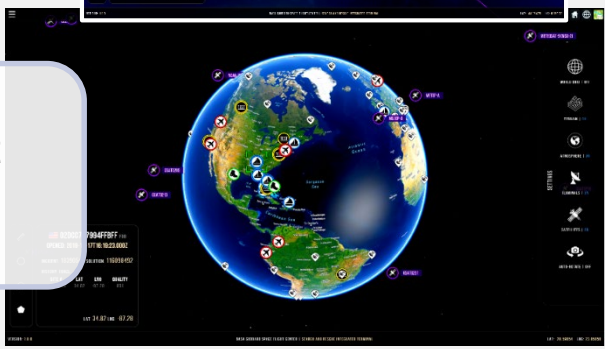
- New customer, new application, new mission type
- Unclear requirements
- Complex database with unhelpful documentation
- Customer not used to custom SW development, Agile dev

Approach

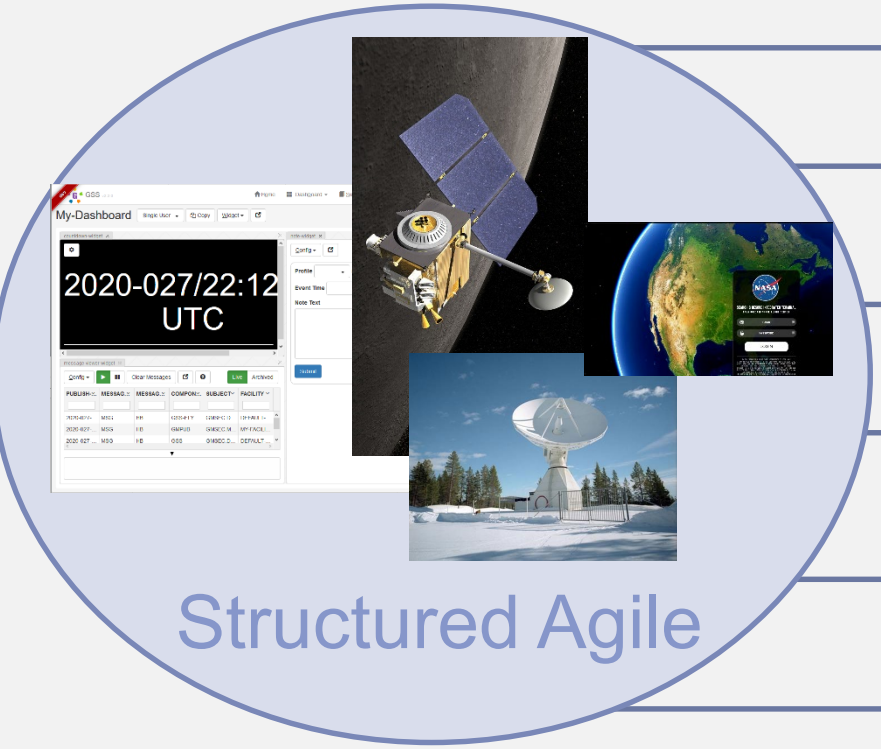
- Agile prototype starting with mapping beacons
- Re-engineering of database
- Weekly customer meetings, with periodic management meetings including sprint demos

Current status

- Expansion of prototype to full operational development
- Support of database passed to team



What is our Structured Agile outcome?



More robust SW testing

Better team communication & cohesion

Good customer feedback

Increased SW development tempo

NASA Process Policy Compliance

More Team Lead headaches….

More: Robust SW, SW drops, SW functionality

Better: Team environment

+ NASA Process Policy Compliance!!!

Lessons Learned

GUIDING PRINCIPLE: The process must help and not hinder the team

COMMUNICATE

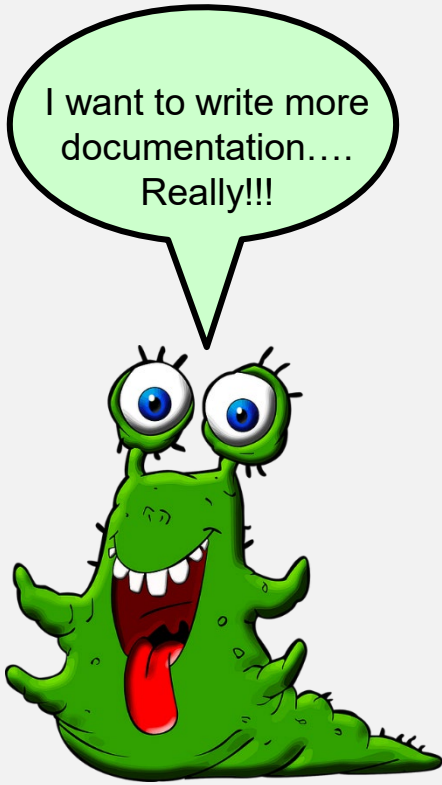
- **Talk through all issues, then talk more.**
- Environment of trust & emotional safety is essential for productive conflict
- Continuous stakeholder communication, again and again and again

AUTOMATE

- **Pick your tools well**
- Continuous automated testing & notification
- Minimize manual document generation
- Link tools (Jira → Git, Git → Robot → Jenkins → Gradle → IzPack)

RESPOND

- **Technical excellence at all levels** → autonomy to respond as needed
- Flat team of SW dev + sys eng
- Quick response to mission/customer needs
- Use sprint outputs for customer feedback



…said no engineer ever…