

The Challenges of Gaia SOC Operations

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gaia

Gaia SOC from ESA viewpoint



- Gaia SOC is an integral part of Data Processing and Analysis Consortium (DPAC)
- A bit unusual for an ESA SOC
- "Classical" roles
 - MOC's primary contact for all payload/science-related mission aspects
 - Mission planning product generation (Scan Law, Science Schedule)
 - Payload health-monitoring
 - First-level product generation and downstream data dissemination
 - Archive development + operations
- "Special" roles
 - CU1: System architecture + MainDB
 - CU3: Development + Operations of AGIS
 - CU9: Support for catalogue creation

- DPCE (Data Processing Centre at ESAC)17/10/2017 ESA UNCLASSIFIED - For Official Use



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DPCE in DPAC – what is it responsible for

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DPCE Daily Pipeline







Our Challenge: dealing with complexity!



- Operations are very complex
 - Very ambitious top level requirements
 - > Near real-time processing
 - Systems strongly coupled: many dependencies
 - Systems developed by external parties -> hard to integrate
 - **Performance** requirements strict → Science Alerts can't wait / Payload monitoring
 - Data volumes -> 35-90GB of inputs become 300-500GB to be served to the DPCs daily



Dependency Triangle Dealing with 3 variables

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Difficult to maintain equilibrium ...







... but possible!

code





Addressing:

- Prioritise, de-scope requirements
- Adapt dev. processes to operations
- Continuous processes, automating
- Continuous

improvements: new tools, technologies

- Realistic testing
- Keep team motivated

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Test, test, test, test,

- If it's not tested, assume it doesn't work
- Development, 'pre-mission' phase
 - Simulators are essential
 - Verify at all layers: Software is not everything
 - Operational Rehearsals: include challenges
 - Update risks for what fails or is not tested
 - Think ahead: develop flexible realistic testing environments
- In Operations
 - Make good use of the experience gained:
 - > Review contingencies, include non-nominal inputs, ...
 - Ops. team is in charge of testing (+automation, +realism, etc.)
 - Handle formalities so that they are useful and not a burden





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New tools / technologies



- = Continuous Improvement
- Architecture in layers makes easier to add or improve / replace functionalities that don't work in Operations as expected

• E.g.

- DB Mirror evolved over time
- IDT bulk reprocessing, allow fast and reliable regeneration
- Accountability (#inputs = #outputs) is closely monitored now with new tools on top of software systems
- Spark for data analysis of big datasets
- Processes improved: Mantis -> Jira, documentation

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Engaging Operations Team

- Lack of engagement = lower resilience to stress -> less effectiveness, risk of burnouts:
 - Foster open communication, enhance visibility
- We apply Agile methods to achieve those: Kanban (no time-boxed)
 - Visualise the workflow by means of sticky notes on a whiteboard shared by the team
 - Stand-up meetings
 - Work-in-progress limited
- Benefits
 - Team more trained, less stressed (responsibilities are shared, team is focused on a limited number of tasks)
 - Bottlenecks reduced, higher issues resolution rates



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What's next ...



• Increasing **cyclic activities** (and more demanding in terms of data volume and performance)



European Space Agency

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DRC MDB Size 800 TB CU8 CU7 CU6 CU5 600 TB CU4 CU3 IDU SDN CU3 IDU IPD CU3 GSR 400 TB CU3 AGIS CU1 INT 200 TB 0.0 DRC-DRC-DRC-DRC-DRC-DRC-DRC-DRC-DRC-DRC-DRC-DRC-DRC-DRC-00 01 02 03 04 05 06 07 08 09 10 11 12 13 ESA UNCLASSIFIED - For Official Use ESA | 17/10/2017 | Slide 13

Cyclic Data Volumes Expectation

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What's next



- Work on data storage to allocate the expected volumes: plans for deletion, smart distribution of data, fast accesses, etc.
- Ensure data transfers with the rest of DPCs:
 - Optimise bandwidth identifying bottlenecks
 - Accurate estimations (->1Gbps will be enough?)
- Reduce costs
 - Optimize Daily Processing for the sake of Cyclic Processing
 - Other technologies?
- Other improvements: reprocessing, monitoring, etc.

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Take Home Messages



- Value **simplicity**: be realistically ambitious (especially with requirements)
- Adapt processes to Operations (or make them simple from the beginning)
- Manage your **dependencies** before you need to
- If it's not **tested**, assume it doesn't work
 - e.g. if you haven't tested your backups -> you don't have backups
 - "Having no problem is the biggest problem of all"
- Rely on **automation**: continuous integration and deployment
- ... and continuous improvement, too
- Care for your **team**. They are the most valuable resource



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Thank You! Questions?



Everything should be made as simple as possible, but not simpler. Abert Enstein





KEEP CALM

AND

LEAVE IT TO THE OPERATIONS TEAM

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