



Lockheed Martin and GPD: A Long, Strange, But Mainly Good Trip

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About the Speakers

Alan Atkins

- Senior Software Engineer, Lockheed Martin
- 20 years experience with Lockheed Martin, focused on Finance and IT
- Recently climbed a 14,265 foot mountain in winter.

Jeff Morin

- Solution Architect, Lockheed Martin
- 30+ years experience with Lockheed Martin focused on manufacturing and IT.
- Avid snow skier

Key Outcomes/Objectives

1. Understand the need for GPD and how it has evolved over time
2. Understand the lessons learned from 20+ years of GPD at Lockheed Martin
3. Learn about the next generation of GPD and what it might bring

Agenda

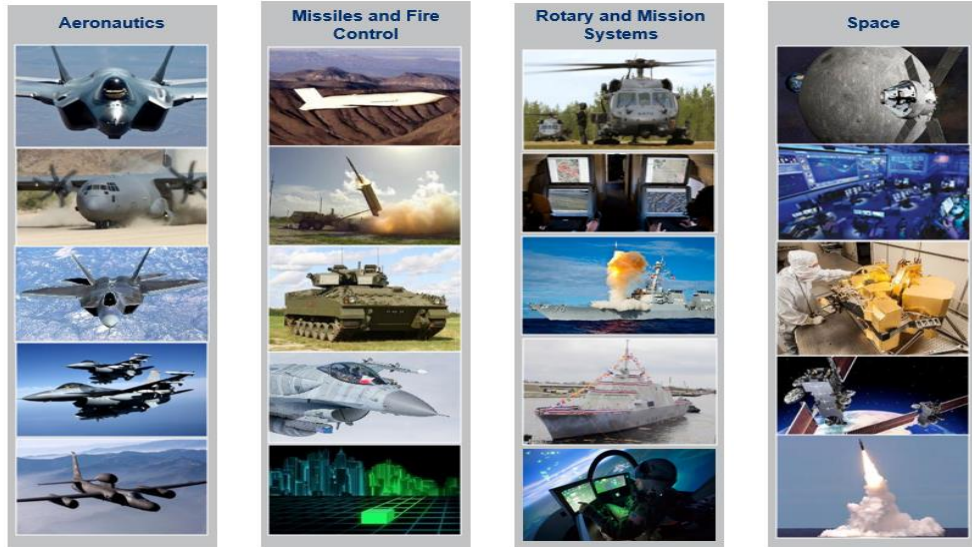
- Company Overview
- GPD Rationale
- GPD Time Line
- Our GPD Experience
- Next Generation GPD – We Have a Dream!
- Wrap Up

Lockheed Martin Corporation - Who Are We?



Your Mission is Ours.

Headquartered in Bethesda, Maryland, Lockheed Martin is a worldwide global security, aerospace and information technology company that is principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services



LM International - Cross Business Capability Integration

105,000
Employees



54,000
Scientists and
Engineers



375+
Facilities
Worldwide



Operating in over
54 Countries



With **7,500+**
Employees

- **2018 Sales:** \$53.8 Billion
- **Stock Ticker Symbol**
 - LMT, on the New York Stock Exchange.
 - Ranked 59th on the 2018 *Fortune 500* list industrial corporations



About SAP at Lockheed Martin

	Aeronautics	Rotary & Mission Systems	Missiles and Fire Control	Space	Enterprise Operations	International
Finance	✓	✓	✓	✓	✓	✓
Operations	✓	✓	✓	✓	✓	✓
Procurement	✓	✓	✓	✓	✓	✓
Analytics	✓	✓	✓	✓		✓
Learning	✓	✓	✓	✓	✓	✓

- 90 Production Systems (SIDs) in the Enterprise, plus Sandboxes, Development and Quality Environments
- Most SAP technology deployed: ECC, S/4 (Central Finance), HANA, Portal, BW, GRC, IDM, BOBJ +

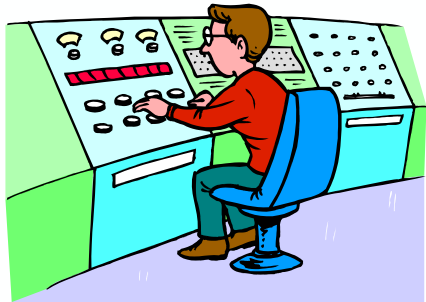
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Business Rationale for GPD



- A&D companies engaged in project oriented manufacturing require:
 - The ability to recognize costs against the requiring contract(s) on the receipt/payment of purchased material.
 - The ability to commingle requirements in MRP from many contracts and satisfy these from common consolidated replenishment orders.
- A&D companies need project financial control of material and the logistical flexibility to share between contracts to improve efficiency.



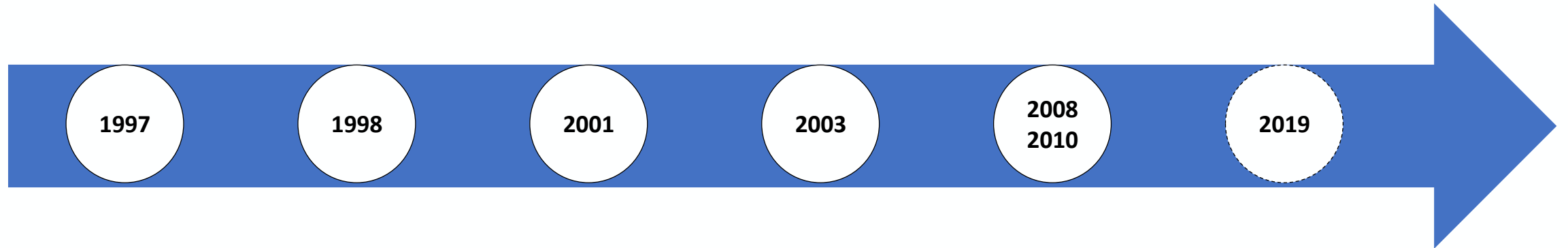
Business Rationale for GPD

- Core SAP functionality has plant and project stock available.
 - Neither stock types support typical A&D manufacturing environment very well.
- Project stock provides project financial control, but not logistical flexibility:
 - Owned by project on goods receipt of material.
 - Actually is “WBS” stock, and not easily shared between different WBS’s
 - To share between different WBS’s requires a manual inventory transfer.
- Plant stock provides logistical flexibility, but not project financial control
 - Plant stock not charged to project until goods issue to project
- Grouping, Pegging, and Distribution (GPD) provides logistical flexibility with project stock.

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GPD Historical Timeline



R/3 3.0F

- 1st A&D Solution
- AKA "CCP/P"
- 3 customers
- Poor quality

4.0/4.5B

- Total re-write
- Val Proj Stock
- Lack of cost element visibility
- No exception handling
- Minimal industry adoption

4.6C

- Total re-write
- Non-Val Proj Stock
- No Cross-plant
- Wider adoption

4.71

- Pegging re-write
- Cross-plant support
- Wide adoption

ECC 6.0

- Re-write for performance optimization
- Pegging functional improvements

S/4 1909

- PMMO
- New pegging
- New distribution

GPD has evolved significantly over the past 20+ years !

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GPD @ Lockheed Martin in Nutshell

	Bus. Area # 1	Bus. Area # 2	Bus. Area # 3	Bus. Area # 4
Grouping Strategy	2	2	2	1
Number of Groups	5,100	500	14,000	1,000
Pegging Table Size	25M	11M	5M	3M
Pegging Performance(min)	720	150	120	37
Distribution Performance (min)	90	150	1800	4
Significant Customizations	<ul style="list-style-type: none"> • Exception Handling • Logistical + detail pegging • Mfg Earned Value 	<ul style="list-style-type: none"> • Exception Handling • Logistical pegging 	<ul style="list-style-type: none"> • Exception Handling • Logistical + detail pegging • TBLP • NWA costing 	<ul style="list-style-type: none"> • Exception Handling • Pegging Freeze

Initial Challenges – the early days

- Performance
 - Initially – Long Run Times (e.g. Pegging – 6 hours for one business area)
 - Now (45 minutes)
- A&D Usability – Specific A&D needs
 - Valuated Project Stock (4.0/4.5), solution did not work
 - Exception handling (Excess, Scrap, Lost) – lack of tools/templates requiring from-scratch design
 - Disconnects between MRP and GPD pegging
 - Lack of key customization points (BADIs)
 - No defined solution for managing CFM/GFM
 - Difficulty moving inventory across plants
- Understanding the Product!
 - Minimal expertise available to design solutions/customization
 - Lack of knowledge of developed GPD software
 - DCAA/DCMA buy-in to core design of GPD
 - Program resistance to design involving sharing of inventory and encountering cost shifts across programs, CLINS, contracts.

Core GPD Challenges Today

- GAPS / Functionality Challenges
 - Exception Handling
 - No standard/delivered solution
 - Goods Movements
 - Circular/recursive assignment of goods issues
 - Hard exits (short dumps) for with GPD vs IM stock differences
 - Inconsistent FIFO logic for issues/reversals
 - GPD Pegging Traceability - Lack of visibility to cause of pegging/cost shifts
 - Next higher & Top/End item visibility
 - Audit Support difficult
 - Reporting
 - Ability to roll up cost at a product/assembly level
 - Mismatch between ERP reporting and Program EVMS systems
 - General Pegging issues
 - Recursive goods issues / rework
 - UofM / Rounding
 - Integration with core ERP – inability to use core SAP functionality with GPD
 - Production Order Splits
 - Stock Transport orders (limitations)
 - Lack of standard edits/validations to prevent downstream GPD problems
- Most GAPS closed with customization or customer Notes from SAP

Significant Areas of Customization

- Exception Handling
 - Excess, Scrap, Lost logic – coded from scratch
 - Group to group transfer (ownership group) customization resulting in unique solutions for tracking historical pegs
- Logistics/Detailed Pegging
 - Custom code to track next higher and top level assemblies for pegs
- Freeze Logic (one business area)
 - Freeze (hard pegging) logic
- Historical/Change logging - Pegging
 - Tracking Tables for all pegging changes
- Reporting
 - Peg up/Peg down goods issue trees
 - Cost Rollup. Product/Assembly level reporting
- Borrow/Loan Payback (one business area)
 - Use of similar logic to initial SAP “TBLP” functionality (which is no longer available)
- Customer Furnished Material (CFM) and Government Furnished Materials (GFM)
 - Customized designed to track, capture cost
 - Customized reporting
 - Different solutions developed for each business area
- Manufacturing Earned Value (one business area)
 - Major enhancement for production EV

Self Imposed Challenges

- Over customization - GPD requires custom code for all customers, but in some cases we may have taken it a step too far.
 - Freeze logic
 - Custom Borrow/Loan payback solution
- Not Using GPD the way it was designed
 - Proliferation of groups – allowing programs to segregate (hoard) inventory, negating the core benefit of grouping requirements and replenishments.
 - Type 1 Grouping used where Type 2 would be more beneficial
 - Mirroring Legacy system processes
- Inconsistent usage across business areas
 - Re-inventing the wheel, different solutions across businesses
 - Eventually lead to a Lockheed Martin cross-business GPD share group, very successful

We are currently working to get back as close to standard as possible



Our Key Lessons Learned

- Get involved with SAP and the GPD Development team
- Share information across business areas, leverage work already done!
- Share information across the A&D community
- Use Grouping the right way – Maximize efficiencies, minimize “hoarding”
- Educate our customers (End Customer, DCAA/DCMA)
- Resist the temptation to customize
 - It’s hard to undo!
 - Very costly to maintain

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Next Generation GPD Background

- GPD Working Group Established in August 2016
 - Defined requirements and areas of improvement for GPD
 - Co-led by Lockheed Martin and Northrop Grumman
 - 8 participating companies
- In-Person meeting held November 2016
 - 20 participants from 8 unique companies and SAP
 - Reviewed & discussed GPD requirements/gaps ~ 100
 - Grouped gaps into 31 enhancement opportunities
 - Prioritized enhancement opportunities for SAP's consideration
- SAP decided in late 2018 to develop a next generation GPD
 - New name - Project Manufacturing Management and Optimization (PMMO)
- SAP held meetings in December 2018 to validate GPD requirements with 3 companies
- SAP held additional on-site customer visits to review GPD usage and design concepts Q1 2019
- SAP planning customer participation testing

PMMO What We Know so Far

- SAP has assembled a development team for PMMO
- Initial limited release targeted for S/4 HANA 1909, but delivered “dark”
 - Only a technical delivery, usage in customer system not possible
- Grouping functionality will be largely unchanged
 - Ideally, an API for creating/changing grouping relationships will be available
- PMMO will have its own separate code and dictionary objects
- Classic GPD will continue to be available in S/4 HANA
 - Project Manufacturing Management and Optimization (PMMO)
- It will not be possible to run PMMO and GPD simultaneously in the same S/4 instance
 - Once PMMO is activated in an instance then GPD is de-activated

PMMO What We Hope to See - 1

General

- Improved functionality which will drastically reduce need for customizations required by customers
- Better Integration with core ERP processes
- Easier to use archiving
- Migration tools provided by SAP to move from classic GPD to PMMO
 - Minimizing historical cost shift
- Well tested solution by SAP and A&D customers

Goods Movement

- More graceful error handling
- Serial number aware
- Better adherence to FIFO through goods movement process

PMMO What We Hope to See - 2

Pegging

- Improved performance
- Better traceability to understand results and changes
- Improved data structure to support ownership group and traceability visibility
- Easier to understand application log error messages
- More useful delivered options for exception handling
- Better handling of STO order pegging
- Better handling of GFE/CFE
- Peg Up and Peg Down Report

Distribution

- Improved performance
- Improve order cost reporting
- Better adherence to FIFO through goods movement process

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Presentation Materials

Access the slides from 2019 ASUG Annual Conference here:

<http://info.asug.com/2019-ac-slides>

Q&A

For questions after this session, contact us at
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