Raytheon

Customer Success Is Our Mission

The Grad School Dropout:

From Physics to Rocket Science and Systems Engineering In 6 Months

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Systems Engineer II
Raytheon Missile Systems
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Background

- B.S. Physics, Michigan Technological University – May 2013
  - Research in experimental nanotechnology, teaching experience, introduction to programming, 4 year member and officer of intercollegiate soccer club.
- M.S. Physics, University of Illinois at Urbana-Champaign – May 2015
  - Research in computational biophysics with Aksimentiev group, more teaching experience, solidification of programming skills, the grad school life
- Systems Engineer II, Raytheon Missile Systems, Tucson, AZ – Present
  - Operations Research (OR) Department of Modeling Simulation and Analysis Center
  - Data analysis, simulation development, development of interactive analysis tools, presentations

Problem Solving, Data, Programming, Interdisciplinary

Derek's Handy Dandy Toolbox

- Python – Numerical and statistical libraries, Numpy, SciPy, **Pandas**
  - ~0.5 years experience with at time of applications, but I knew how to use it!
  - Codecademy, Coursera, Introduction to Data Science INFO490 taught by Robert Brunner (may have new course code), Python seminars on-campus
  - Other languages C++ (~3 years), MATLAB (~6 years)
- 1 (ONE!) Graduate Aerospace Course
  - AE403 – Spacecraft Attitude and Control taught by Soon-Jo Chung
  - Aerospace people do/notate things differently, but not too differently
  - Standard physics curriculum, especially Classical Mechanics and E & M, is sufficient preparation for most concepts and mathematics
- Technical Presentation Experience
  - ~4.5 years teaching experience and multiple presentation courses
  - Teaching = Leadership
- 0 Internship Experience
  - ~4 years research experience, and wide range of class projects

Know your strengths and weaknesses

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Where to find open position

- Most to least successful
  - Career Fairs: Graduate and Undergraduate
  - Network: friends, colleagues and classmates (current and former)
  - Physics Career Seminars!
  - Engineering Career Services: Website and Newsletter
  - Websites of interesting companies (especially those that are at career fairs)
  - Data Science Websites (Kaggle)
  - Job search websites (Indeed, LinkedIn)

- If you can, start search in the early fall, especially for full-time

- Research how companies conduct interviews
  - Phone, multiple rounds, technical, onsite?
  - Glassdoor is great for this, but take reviews with a grain of salt
  - Prepare with details about company and questions to ask them

It only takes one… but make your time count

Path to Offers

- Applications:
  - Many resume reviews by Engineering Career Services
    - 2 versions- Engineering and Programming focuses
  - Filled out hundreds, thousands, billions??? of applications
- Interviews:
  - Google, Software Developer- Intern, Mountain View, CA
  - Raytheon IIS, Algorithm Development near Houston, TX
  - Raytheon SAS, Imaging Analysis, Dallas, TX
  - Control-Tec, Detroit, MI (Automotive Analytics)
  - Khan Academy, Data Scientist, Mountain View, CA
  - ViaSat, Data Scientist, Boston, MA (Telecomunications)
  - Philadelphia 76er's, Data Scientist, Philadelphia, PA*
- Offers –
  - Raytheon Missile Systems
    - Operations Research
    - Guidance, Navigation, and Control
    - Signal Processing
  - Epic Systems (Medical Software Company in Madison, WI)

Interview Practice and Experience = Invaluable

Timeline

Summer 2014 –
Sporadic thoughts of ending schooling with Master's and find a job. Begin focusing on developing programming abilities

October 2014 –
Seriously considering Master's and jobs of interest. Create initial resumes. Go to ECS for first resume review. Apply for a few internships. Sitting in on CS course. Begin going to on-campus company events. Enroll in Data Science and Aerospace courses for spring semester. Google Intern interview.

December 2014 –
Decide to end with Master's and find a job.

January 2015 –
Oh man, this is really happening! I need to find a job in 4 months!
Begin applying to full time positions. Hear about Epic from fellow TA with an offer.

Timeline

February 2015 –
UIUC Career Fair: Apply and speak with Epic and Raytheon along with many others. Receive follow up contacts from those two. First phone interviews within two weeks. MTU Career Fair: First face to face Interview for full-time position with Control-Tec. Take Epic Assessment. First rejection from Control-Tec. =/ First Raytheon position falls through. =[Hear from second Raytheon position, have phone interview. =] Contacted by Khan Academy for project based web interview. =D Get invited for onsite interviews for Epic and 2nd Raytheon position. (^-^) Receive email from recruiter for RMS requesting my application for 3rd Raytheon position. (^ᴗ^)

March 2015 –
Onsite Epic interview, RMS phone interview. 2nd Raytheon position onsite interview in flux due communication and schedules. (ᵒ_ᵒ) Receive invitation to RMS hiring event. (ᵒᴗᵒ) Receive job offer from Epic. (^ᴗ^)

April 2015 –
Begin contacting friends of friends with experience at Epic. RMS Hiring event in Tucson. Notified of 3 departments wish to extend job offers that same day. Learn more about positions through network. Decide to go with OR. Phone interview with ViaSat. Receive formal offer. Turn down invitation to on-site interviews for 2nd Raytheon position, and ViaSat position. Consult with ECS for negotiation of RMS offer, send counter-offer, receive improved offer. Accept offer, notify Epic of decision. (^o^) Receive request for phone interview from Philadelphia 76er's. ¯_(^ᴗ^) _/¯

Interview Process is Exhausting!

Offer Review

- RMS Operations Research
  - Operations research due variety of topics, shorter project duration, chemistry with leadership and team
  - RMS over Epic because more directly applicable background experience, more career opportunities, better work, better work-life balance, willing to negotiate offer

- Used Engineering Career Services to come up with counter offer
  - Pay attention to how recruiter communicates with you
  - Use this knowledge in your pitch for a counter-offer

- “Soft” skills are just as important as technical skills, if not more!
  - Do not neglect either, use both as justification for the counter offer

Offer Received != Finished

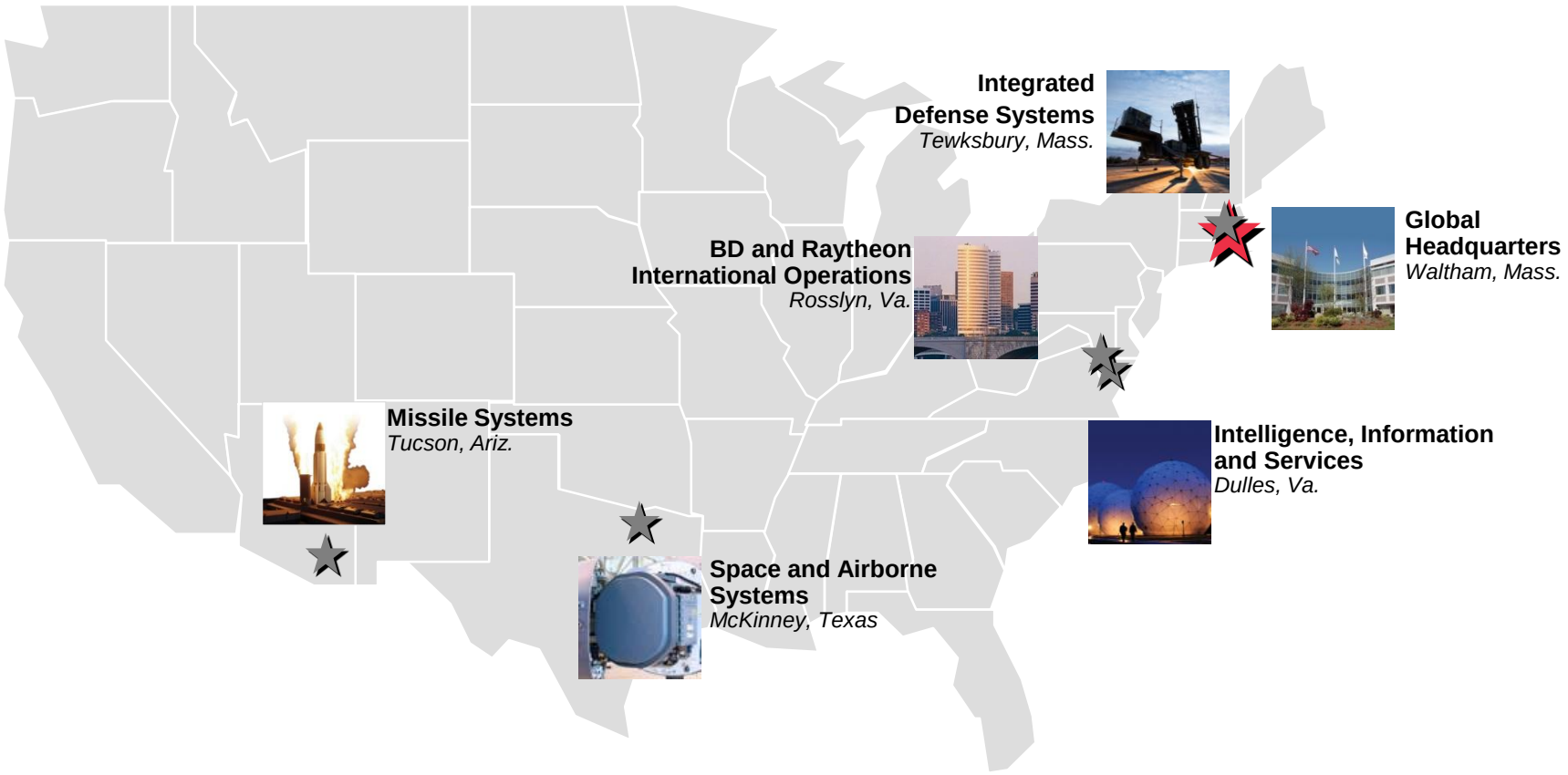
Things I Would Have Done Differently

- Create Github projects from school projects and research
  - More and more valuable
- Internship
  - Opens doors, learn different skills
- More focused job search
- More computer science classes
- Practice technical interviews more
  - With ECS and willing victims (friends)
- Start search earlier

Who/What/Where is:

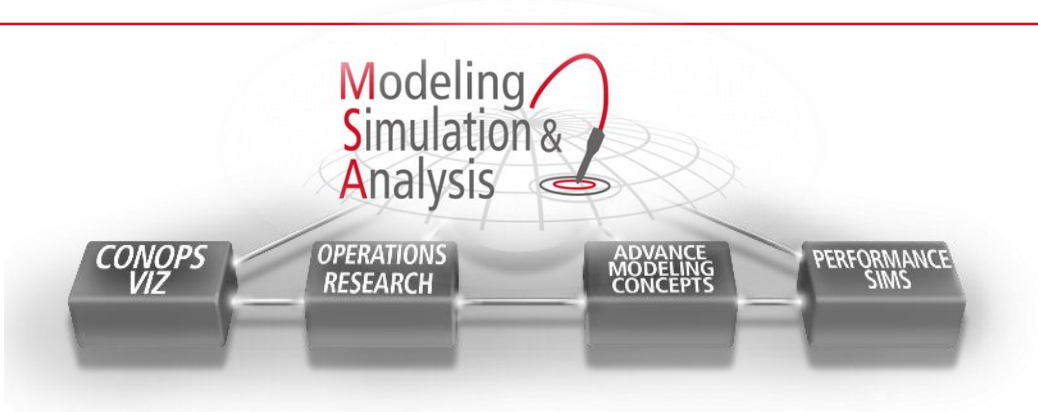
- Raytheon
  - Missile Systems
    - SD&P
      - Modeling, Simulation, and Analysis Center
        - Operations Research
        - Advanced Modeling Concepts
        - Performance Simulations

Business Headquarters

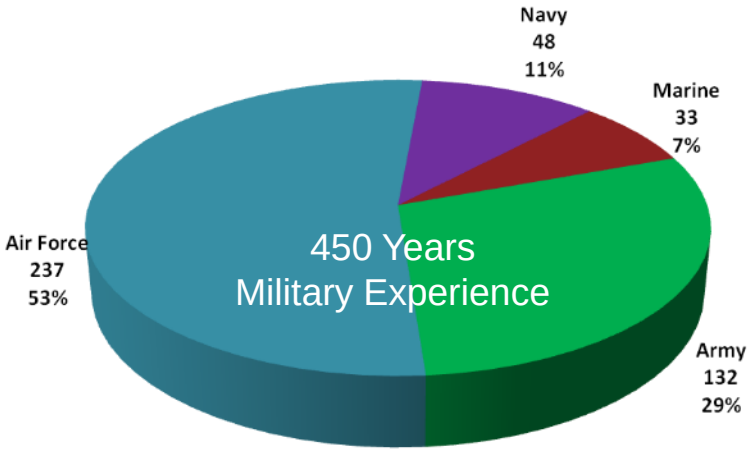


61,000 employees; 2014 net sales: $22.8 billion

Who Are We?



- Our SD&P MS&A team is integrated across many functions and Product Lines here in Tucson (all sites) and in Huntsville AL
- We are ~300 folks strong and growing, organized into 4 Departments
- Our educational background is:
  - 450+ years of combined Warfighter experience
  - ~5% have PhDs
  - ~50% have Masters degrees
  - ~40% have Bachelors degrees
  - ~5% have Technical school or partial degree



Modeling, Simulation and Analysis (MS&A)

- Built on four key groups
  - Operations Research
  - Advanced Modeling Concepts
  - Performances Simulations
  - CONOPS Visualization

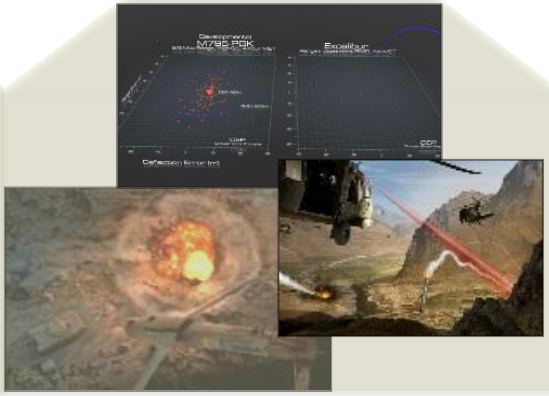
- Video for proposal presentation
  - Helped customer understand concept
  - Result—WIN!

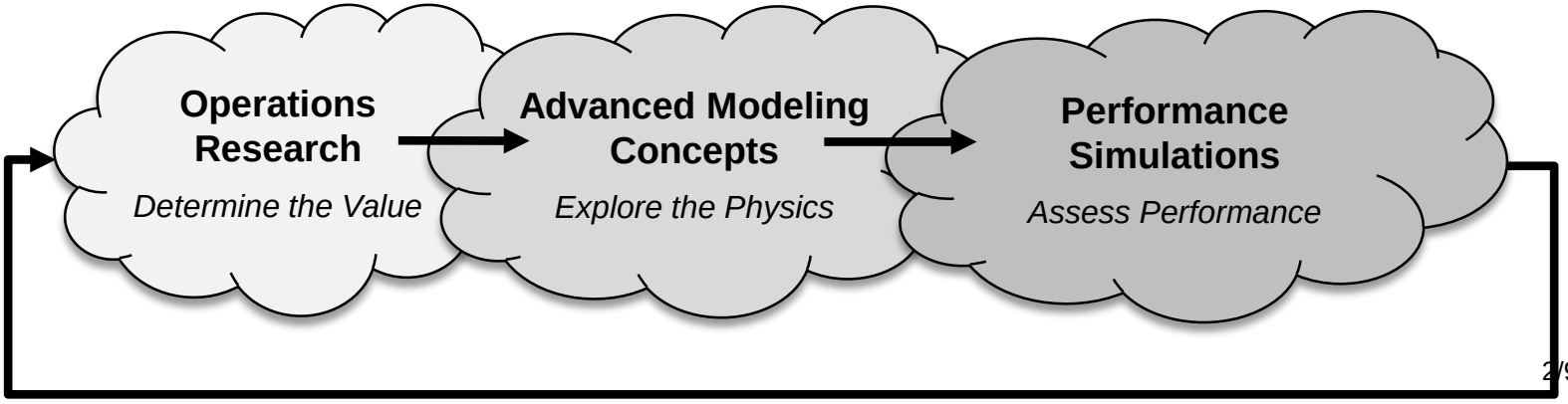
- Great example of breadth of MS&A

https://www.youtube.com/user/raytheoncompany

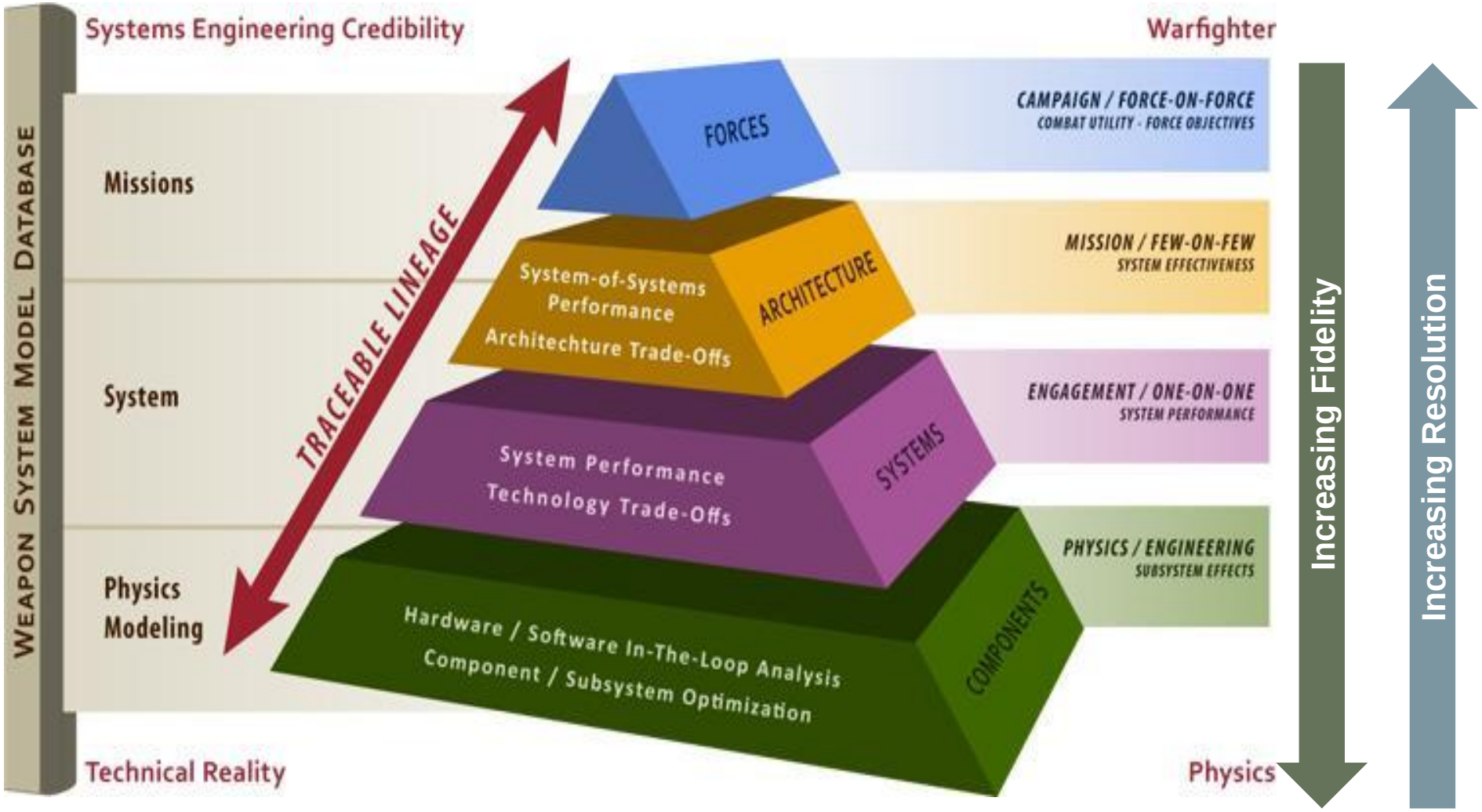
Complete Life Cycle Support

Identify Revolutionary Technologies	Shape Customer Needs	Understand Customer Gaps/Capabilities	Understand Specific Customer Needs	Develop Customer Solutions	Produce Customer Solutions

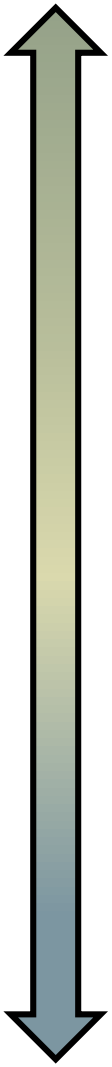




Tool Decision – Fidelity vs. Resolution



Spectrum of Analysis Tools



Simple Environment
Less Detail
$ - Low Cost
Fast

Complex Environment
Very Detailed
$$$$ - High Cost
More Time Required

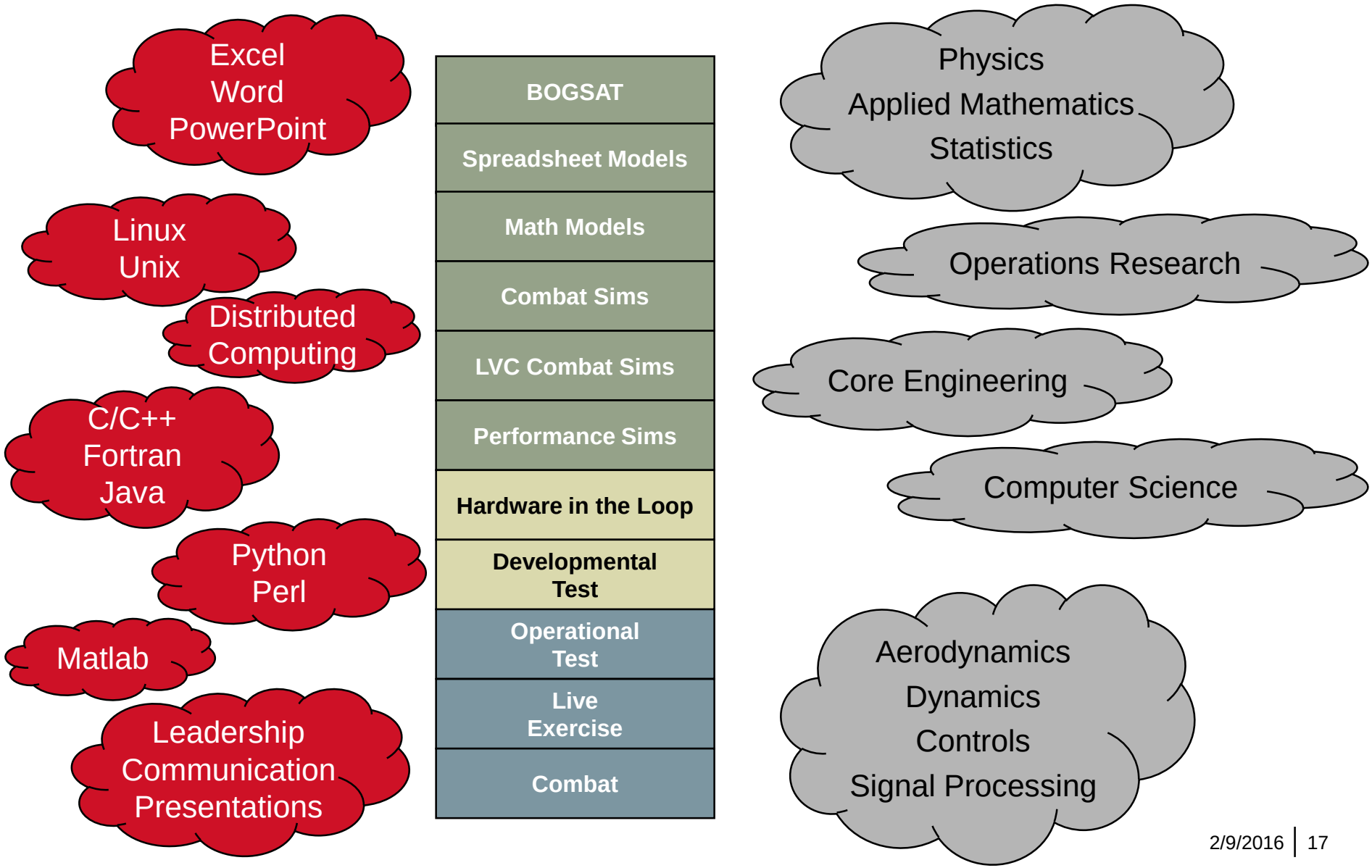
- BOGSAT
- Spreadsheet Models
- Math Models
- Combat Sims
- LVC Combat Sims
- Performance Sims
- Hardware in the Loop
- Developmental Test
- Operational Test
- Live Exercise
- Combat

Requirements Analysis
Design Maturation
System & Force Effectiveness
Military Utility

Subsystem Optimization
System Test & Verification
Support for OT&E

Government Realm
Contractor can support
System is operational

Skills Required



Operations Research

- Wide spectrum of capabilities across complete lifecycle

- Some questions we answer:
  - What's the best bang-for-the-buck?
  - How many weapons needed to achieve desired effect(s)?
  - How many weapons should the government buy?
  - Is my system affordable?
  - What is the concept of operations (CONOPS)?
  - Can the end user use the weapon system as designed?

Product Comparisons

Virtual Combat Systems

Concept of Operations

Providing responsive and effective operations and mission analysis, spanning the spectrum from first principles through campaign, supporting all phases of product acquisition

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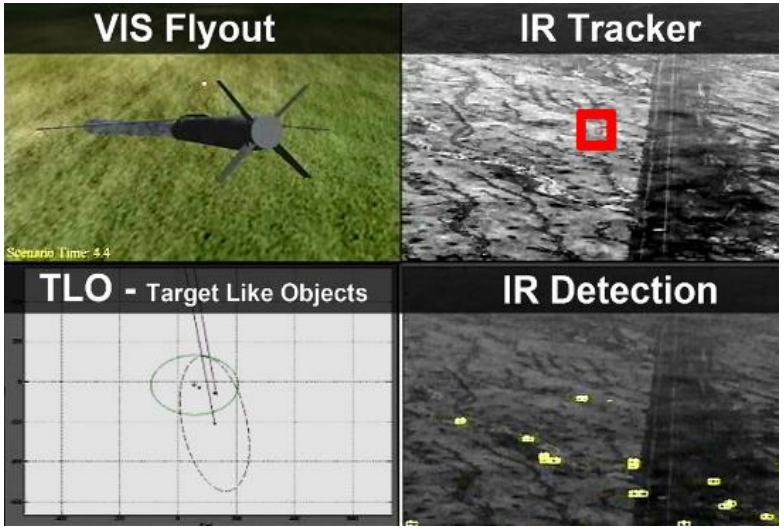
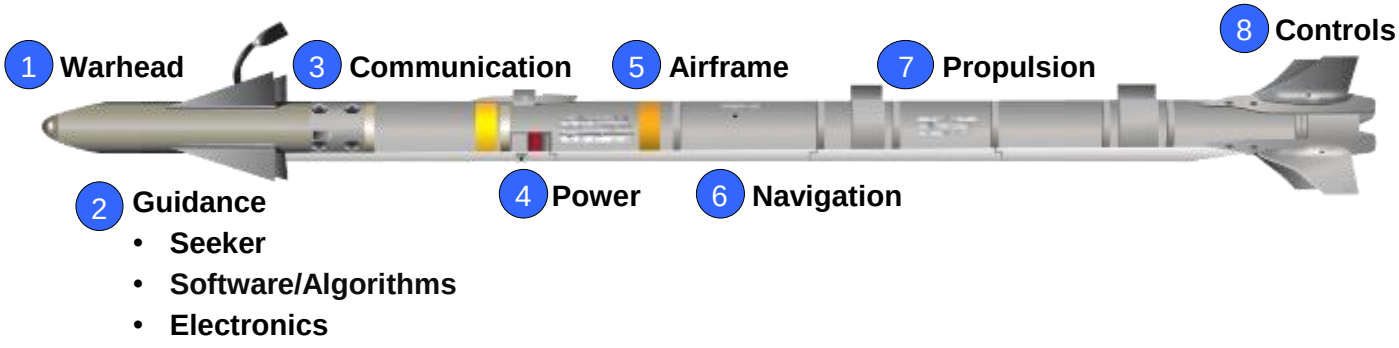
Performance Simulations

- Integrated Flight Simulations
- 6DOF Simulations
- Algorithm Development Support
- Software In-the Simulation
- Real-Time Simulations
- System Performance Assessment
- Pre-Flight Predictions
- Post-Flight Analysis/Matching
- Field Support

Integrated Flight Simulation Runtime Dashboard

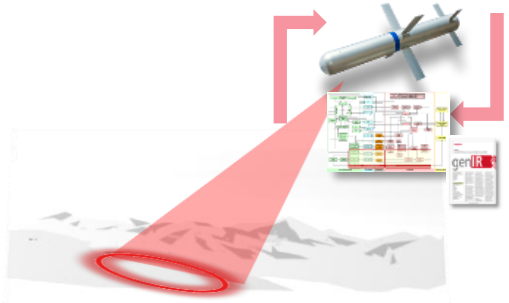




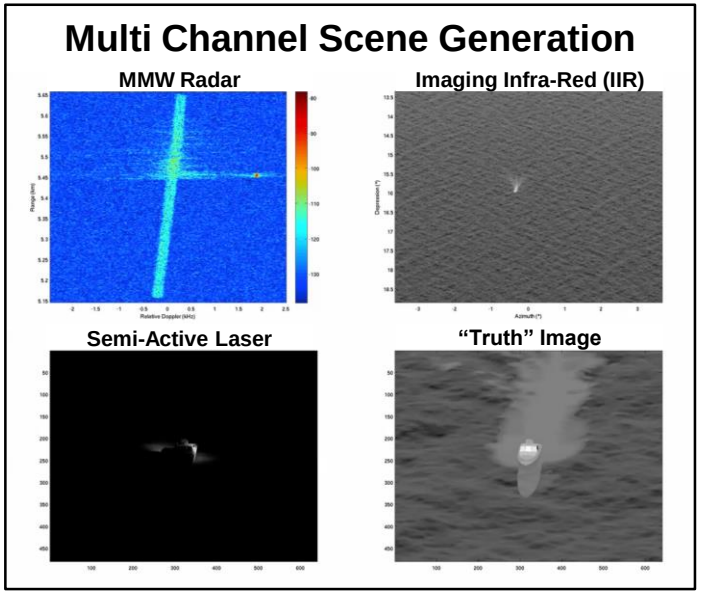
Efficiently develop, maintain, and enhance credible digital simulations and perform analysis to help enable customer success

Advanced Modeling Concepts

- Real Time Scene generation
- System Architecture
- Distributed Simulations
- System Tools & Infrastructure
- Testbeds & Advanced Simulations
- Simulation reference architectures
- Remote Sensor Modeling
- Embedded Implementation of Simulation
- Software Development Area (SDA) Compliance & Maintenance



Closed-Loop Simulations The System Laboratory that a simulation is meant to be



Enable the development of advanced systems which demand innovative modeling and simulation based on a clear understanding of customer needs.

CONOPS Visualization

- What it is
  - Create video and animation products for Raytheon
  - Experience from:
    - Hollywood visual effects
    - Game development
    - Post production studios

- Why it matters
  - Bridges gap between Engineering and Marketing
  - Rapid comprehension
  - Maximize value of time with customer

Approved for Public Release. DoD OSR 2-S-2643. 8/2/2012

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Creates award-winning, technically accurate, visually compelling messages that help capture business and engage customers.

Modeling Simulation & Analysis Center

Operations Research

Providing responsive and effective operations and mission analysis, spanning the spectrum from first principles through campaign, and supporting all phases of product acquisition, pursuit and development from front-end strategy through deployment and product improvements.

- Concept of operations
- Military utility analysis
- Experimentation/demonstrations
- Live-virtual-constructive framework
- Combat / kill-chain simulation
- Mission Planning

Provide Analysis in any Battlespace

Advanced Modeling Concepts

The AMC department forms the bridge between high-level, CONOPS-focused modeling capabilities of the Operations Research Department and low-level, high-fidelity capabilities of the Performance Simulations Departments within the MS&A Center.

- Animation and visualization
- Scene Generation
- genSim™
- Grid/HPC computing
- Missile Defense Theater Level Simulations (ITADS, BMDSSIM)
- Distributed simulation testbeds

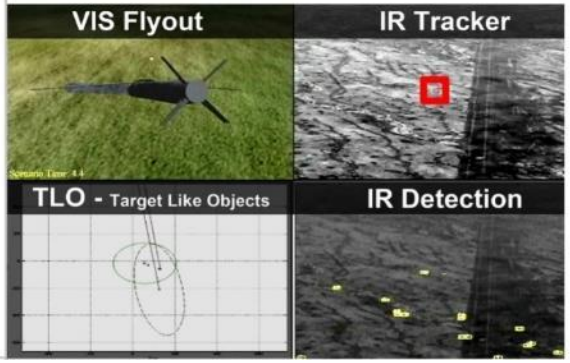
Develop Advanced Modeling and Simulation Techniques

Performance Simulations

The Performance Simulations Departments are developers of credible simulations that are used as the main development environment for system engineering and performance assessment.

- Integrated flight simulations/6DOFs
- System performance analysis
- High- and low-fidelity modeling
- Pre- and post-flight analysis
- Algorithm development platform
- Software-in-the-simulation
- Real-time simulation development

Develop, Maintain, and Operate CREDIBLE Digital Simulations



Is Rocket Science for you?

- Interested in Raytheon Missile Systems or other business units?

- TOMORROW, Tuesday, February 9th
  - 6 representatives (including me) will be at the Engineering Career Fair

- Thursday, February 11th
  - Representatives at Industry Hour

Come listen to me talk more!

The End?

Questions?