NOAA Global Systems Laboratory

Making IT Happen
Building a Foundation for Science

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Global Systems Laboratory

Our IT Goals

- IT Services to support science for improved forecasts
- Well managed and efficient facilities and infrastructure
- A reliable and resilient data network
- A robust scientific computing environment
- Data Services to enable research & development
- IT Security to protect facilities, systems and users
- A telework-ready and empowered workforce

Our Guiding Principles

Reliable

- consistently good in quality or performance; able to be trusted

Resilient

- able to withstand or recover quickly from difficulty

Efficient

- achieving maximum productivity with minimum wasted effort

Effective

- successful in producing a desired result or fulfilling a specified function

Compliant

- adhering to policy, standard or specification

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Building an IT Foundation

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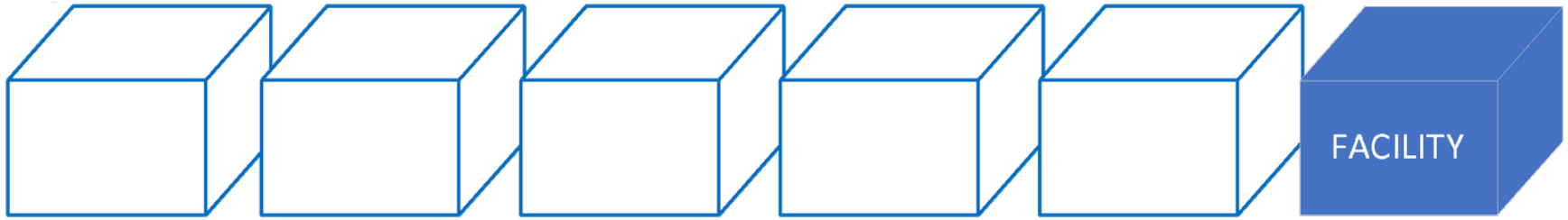
Building Block - Facility

- Monitored 24x7x365
  - SCADA and GSL custom Data Center Infrastructure Management (DCIM) system
- National Fire Protection Association (NFPA) Compliant
- Dedicated infrastructure and facility management (DCEP and PMP certified)
- Focus on energy efficient, reliable, cost effective and sustainable environment

By the numbers….

- 6800 sqft of data center space
- 410 tons of cooling
  - EC Fans saving over $36K per year
- 1220 kw of power distribution
- 3 Clean Agent Fire Systems
- 99.56% = Avg Data Center Uptime
- 8 NOAA/NIST Colocation Customers



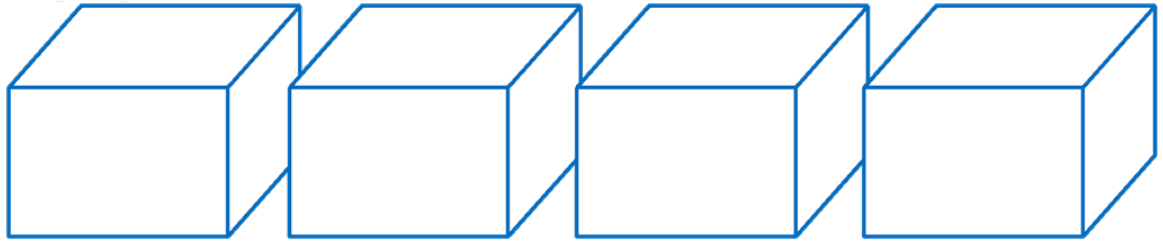
Building Block - Network

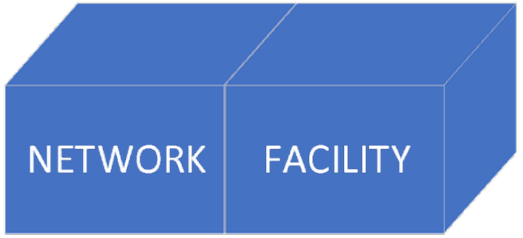
Network Capabilities

- 1Gbps to each GSL Office
- 10 Gbps to servers
- 20 / 40 / 80 Gbps to storage systems
- 80 and 100 Gbps Backbone Interconnects
- Virtual switching
- Non-blocking switch fabric architecture

By the numbers….

- 2500+ Network Cabling Segments
- 50+ Network Devices
- 99.995% Network Availability
- 400 VPN Licenses
- VPN has 1Gbps capability



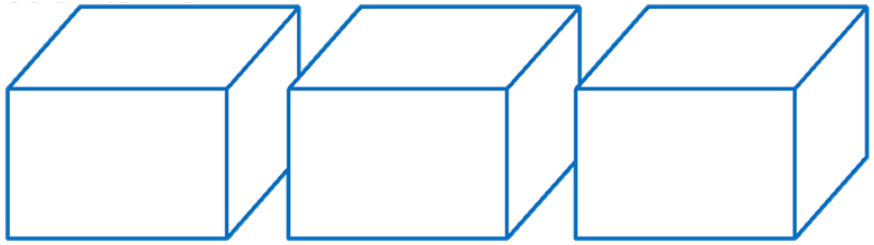


Building Block – Computing Administration

- Scalable enterprise storage (scale out)
  - Spans Internal and DMZ
- Ticketing
  - Onboarding/Offboarding/Contracts/Help System
- Virtualization – Complete
- Containers – Pending (Micro-Services)

By the numbers….

- 402+ Virtual Machines on 10 Hypervisor servers
- 1023 Compute Hardware Devices under management
- >17 Enterprise Software Systems under management



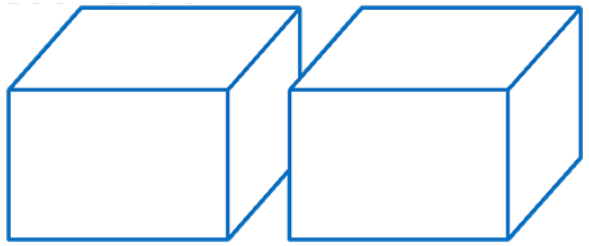
Building Block – Data Services

- Support GSL and wider NOAA community
- Ingest global operational and research data
- Process – decode, reformat, sub-sample
- Distribute GSL research data to collaborators and community
- Save real-time data to NOAA's RDHPCS Mass Store System (HPSS) for retrospective uses

<u>By the numbers….</u>

Distributed data system with:

- 19 virtual hosts
- 400 obs, radar, satellite and model data sets
- 500 time-based (cron) jobs
- 250 event-driven jobs (triggered on data arrival)
- > 6 TB/day saved to HPSS

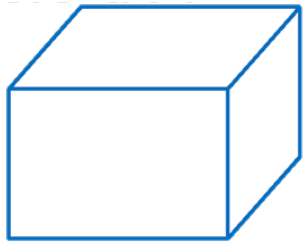


Building Block – R&D High Performance Computing

- Manage Jet (Boulder) and Orion (MSU) systems
- Support Hera, Niagara, HPSS systems (NESCC)
- Help Ticket/User Support (Jet, Hera, Orion, Cloud)
- User Software Management (Jet, Hera, Orion)
- Allocation Management (Jet, Hera, Orion)
- Usage Tracking and Reporting (all NOAA sites)
- Gov Property Management (Boulder and NESCC)

<u>By the numbers….</u>

- 6 HPC Systems at DSRC
- 2,844 Compute Nodes
- 57,744 Compute Cores
- 8PB High Performance File System
- $70 Million in RDHPC Property Managed



Building Block – Cloud

- GSL has a private “on-prem” cloud service
- GSL has access to public Cloud providers
- Numerous OAR Cloud Tiger Team projects are underway in the public Cloud
- Cloud enables Scalability; Portability; Flexibility and Collaboration
- Characterize Cloud costs for future decision making

<u>By the numbers….</u>

- Access to 3 CSPs; AWS, GCP, and Azure
- 6 active projects
- About 20 users (~10% of GSL staff)
- $200k funding for 2021

Building Block – Cloud

Current CLOUD Systems

- Gmail (NOAA-wide)
- Google Drive (NOAA-wide)
- GitHub (NOAA-GSL)
- SmartSheets
- Slack

Future CLOUD Systems

- Data Services extend to the Cloud
- NOAA Data Lake
- NOAA Big Data Project
- NOAA Consolidated Ingest Services

DECISIONS

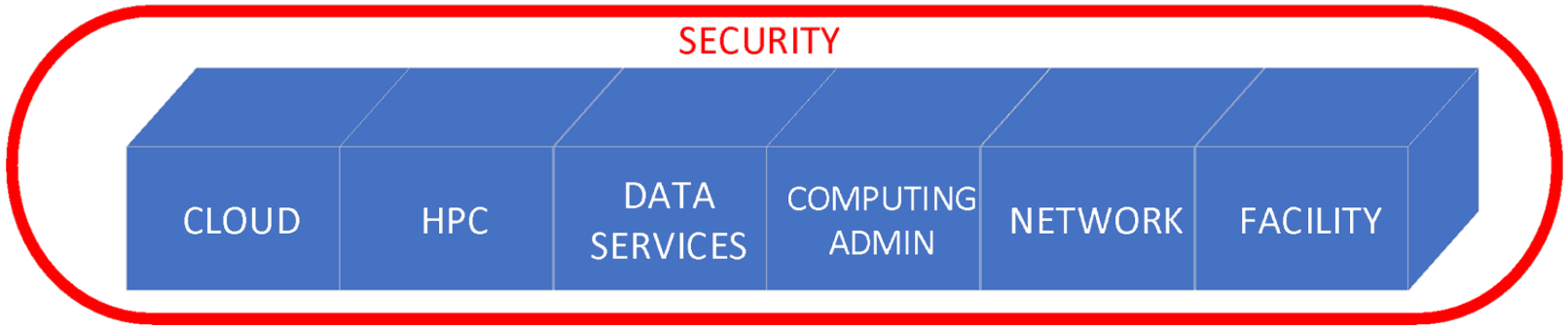
- What should / and should not be in the Cloud?
- Are there Performance or efficiency improvements?
- Understanding the Cost Model?
- Culture change to embrace “Cloud Native” thinking.

Building Block – Security

- Automated Solutions
- Self Service Capability
- Fast Deployment
  - Continuous Integration/Continuous Delivery
- Operational Resilience
- Enterprise Continuous Diagnostics and Mitigation (CDM) – BigFix; FireEye
- Increased “technical” enforcement of compliance

<u>By the numbers….</u>

- Compliant with 198 Controls
- 377 Control enhancements
- Mitigate over 1300 vulnerabilities per month
- Block hundreds of thousands of attacks daily



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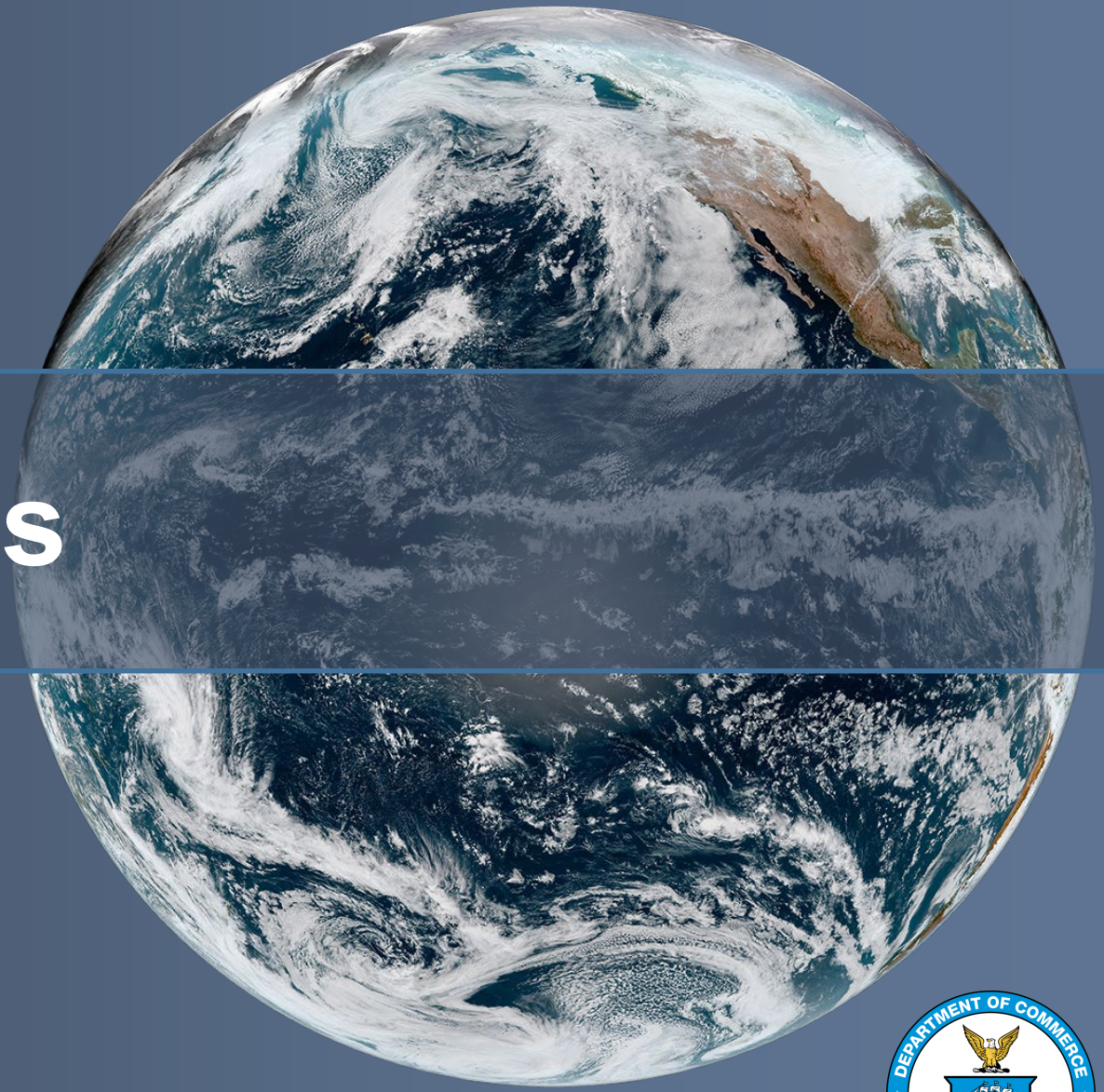

IT Constantly Changes

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Collaborators – Learning

- Boulder IT Council
  - Boulder Campus IT Team – NOAA, NIST and NTIA
- Senior IT Managers
  - All Senior IT Managers across OAR
- ESRL IT Council
  - Four ESRL Laboratories Senior IT Managers (FISMA NOAA3500)
- Data Center Optimization Initiative
  - All NOAA Data Center Managers

Collaborators – Reporting

- IT Enterprise Team
  - Division members interested in enterprise IT issues across GSL
- GSL IT Team
  - All technical IT staff
- IT Architecture Team
  - ITS architects
- ITS Monthly Activity Report
  - All IT activity reported to GSL SLT
- IT Newsletter
  - Monthly newsletter to all of GSL for all things IT

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IT Supports the Science

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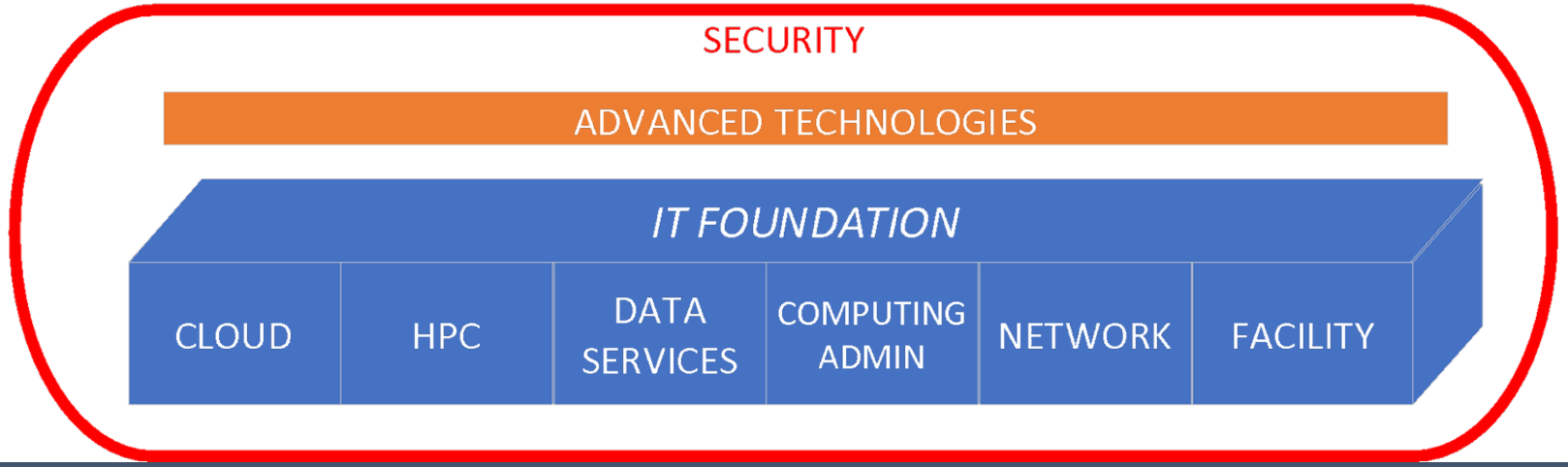
GSL Science Support

Coming Up: Advanced Technologies

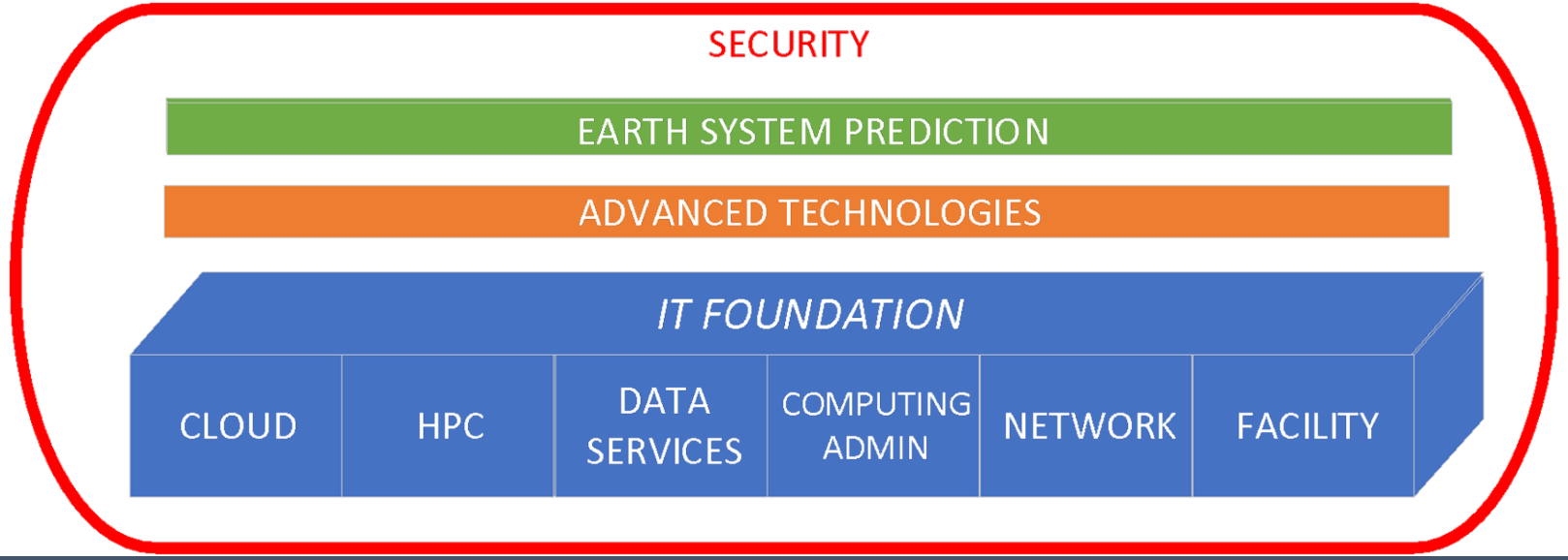
- Explore
  - Computing technologies to enable faster, more accurate models
  - Data technologies to improve handling, analysis, delivery, visualization



GSL Science Support

Coming Up: Earth System Prediction

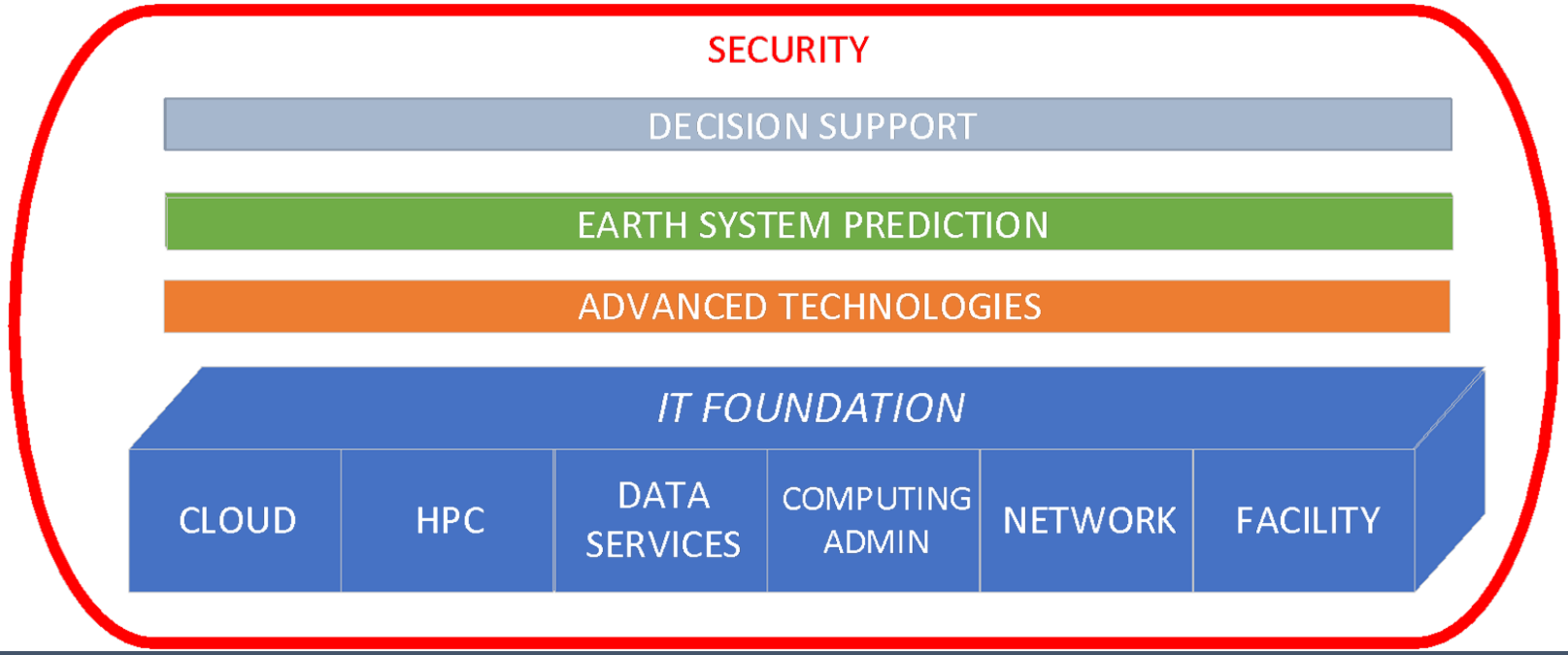
- Data Assimilation
- Modeling
- Prediction across scales



GSL Science Support

Coming Up: Decision Support

- Data for Impact-Based Decision Making
- Data for Improved Uncertainty and Confidence Information



Thank you!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