Army Science & Technology

Vectoring Army Basic Research

2012 NDIA Science & Engineering Technology Conference Charleston, SC

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Office of the Deputy Assistant Secretary
of the Army for Research and Technology

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Army Basic Research – Vision

Vision

Advance the frontiers of fundamental science and technology and drive long-term, game-changing capabilities for the Army through a multi-disciplinary portfolio that teams our technically skilled and agile in-house researchers with the global academic community

Fundamental Research Underpinning Army Capability Development

S&T Investment Strategy
Balanced Portfolio

Studies, Tech Planning Activities

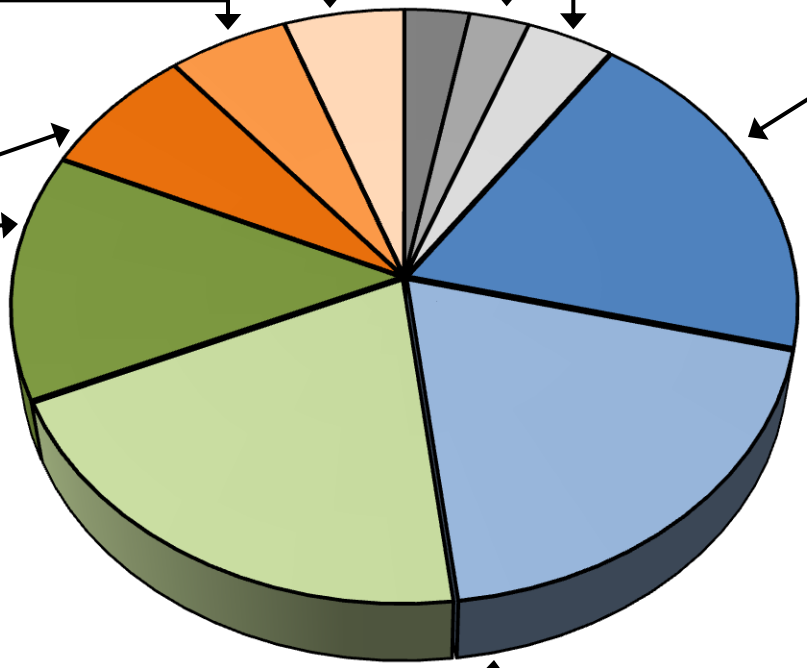
Competitive prototyping; Greater than TRL6

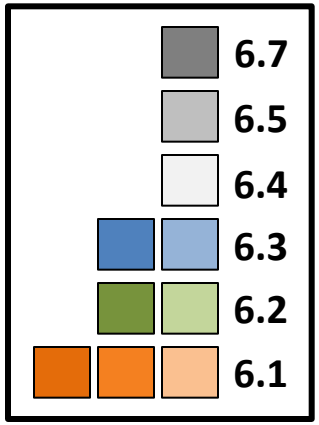
Manufacturing Technology

TECDs—Near-term integrated capability demonstrations—predominately 6.3, may have some 6.2

Long Term Exploration; Invention, discovery, future gazing, technology trends

Long-term Game-Changing (Disruptive) Technology





Long-term Enabling Technology Development—Innovation, invention, technology exploitation to create sub-system opportunities

Mid-term—Innovation*, maturation, technology demonstration; reducing technological risk; predominately supporting planned Programs of Record

* Includes Rapid Innovation Funding

S&T Program Development

S&T Prioritization

Focus of 2011 TRADOC/G8/ S&T Conference

Near Term
7 Big Army Problems
⇩
24 Challenges for S&T

Payoff/ Delivery

TECD Programs Addressing Top 9

TECD Programs Addressing Challenges 10-24

S&T Programs Addressing PEO Needs

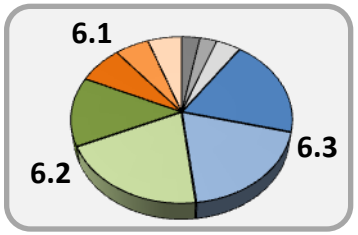
Focus of S&T Planning for POM15

FY12 | 2015 | 2020 | 2025 | 2030

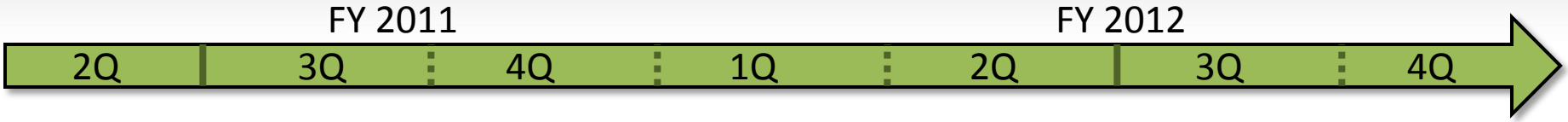
Funding

POM14

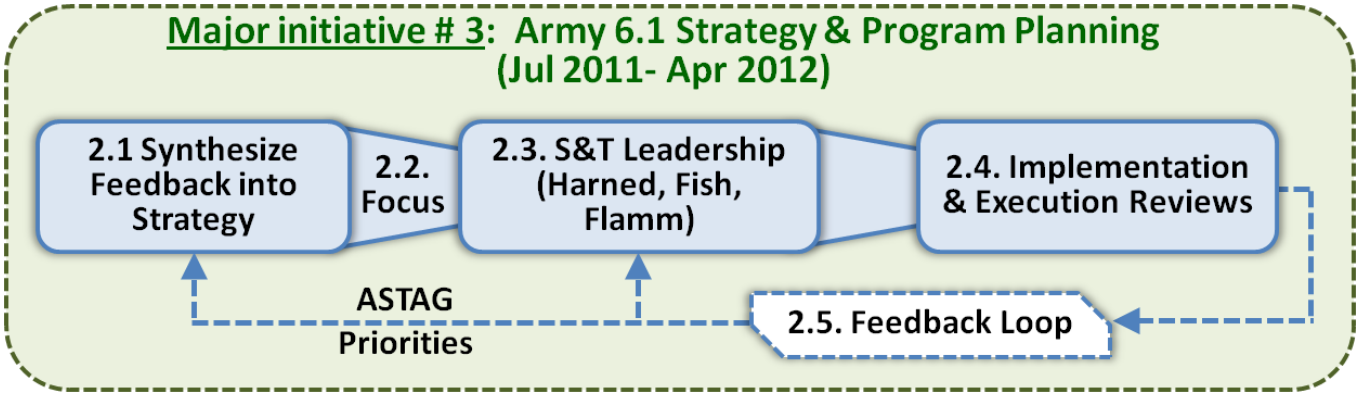
POM15



DASA(R&T) Reinventing Army S&T
Year 2



Year 2 Already in motion !



- ☑ Perform comprehensive review of 6.1 portfolio with focus on results of current programs
- ☑ Scrub and align 6.1 investments with Army S&T portfolio strategy
- ❑ Complete site survey of Laboratories and Centers to determine the state of their resources and facilities to better determine revitalization needs
- ❑ Identify pervasive Army problems for the long-term and identify associated Basic Research challenges and opportunities
- ❑ Have ASTAG validate and prioritize Army Basic Research challenges
- ❑ Kick off program planning to better align investments with Army Basic Research challenges

Portfolio Structure

FY13*
FY13-17*

*PresBud Request FY13

Basic Research Portfolio

6.1 Funding

$444M
$2341M

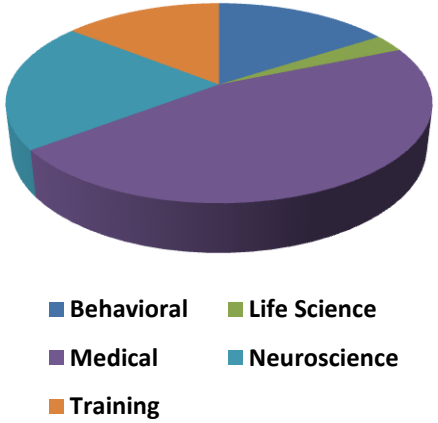
Human Centric	Information Centric	Material Centric	Platform Centric	Enrichment Initiatives
$70M $364M	$53M $298M	$155M $816M	$47M $253M	$118M $611M
Investment Areas - Life Sciences - Behavioral - Training - Neuroscience - Medical	Investment Areas - Computing - Cyber - Decision Making - Network Sciences	Investment Areas - Classical Sciences - Materials Modeling - Biotechnology - Nanotechnology - Environment	Investment Areas - Simulation - Autonomy - Vehicles	Investment Areas - University Research Initiatives - Innovative Lab Research - Educational Outreach - Foreign Technology

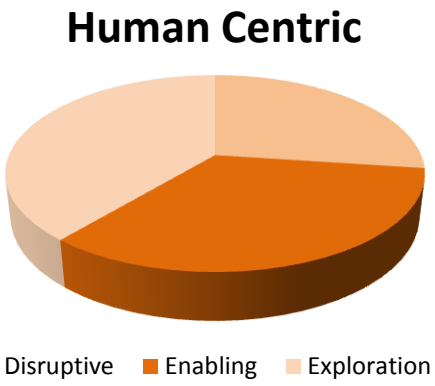
Human Centric Subportfolio FY 13-17

- **Life Sciences**
  - Basic Research in Life Science
- **Behavioral and Cultural**
  - Human Behavior and Social Sciences
- **Training**
  - Graphics and Animation
  - Immersive Environments
  - Human/Virtual Interaction
- **Neuroscience**
  - Neuroscience in operationally relevant environments
- **Medical**
  - Prevention/Treatment of Parasitic Diseases
  - Clinical and Rehabilitative Medicine

Human Centric

- **Life Sciences**
- **Behavioral and Cultural**
- **Training**
- **Neuroscience**
- **Medical**





	FY13	FY14	FY15	FY16	FY17	Total
Total ($M)	70	72	72	74	75	364

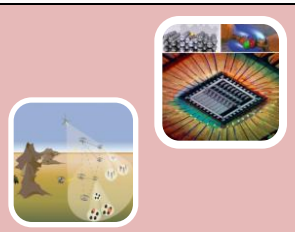
***PresBud Request FY13**

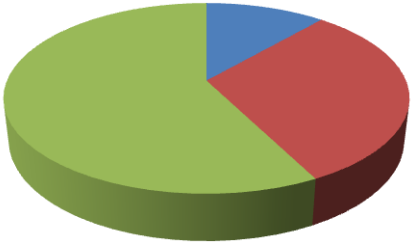
Information Centric Subportfolio FY 13-17

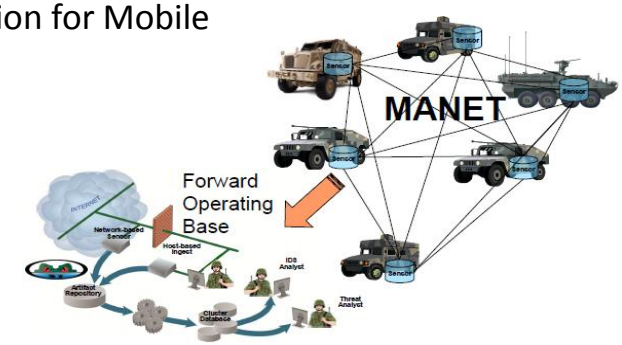
- **Classical Information Sciences**
  - Computing
  - Mathematics
  - Networks
- **Network Science**
  - Network Science Technology Experimentation and Emulation
  - Network Science Collaboration for Social/Cognitive, Information, and Communication networks
  - Networks in Coalition Warfare
- **Cyber**
  - Information Protection for Mobile Ad Hoc Networks

Information Centric:

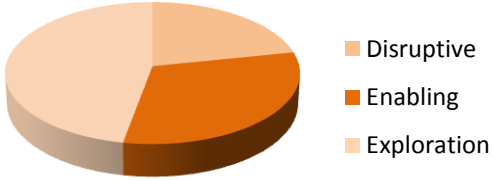
- **Classical Information Sciences**
- **Network Science**
- **Cyber**







Information Centric



	FY13	FY14	FY15	FY16	FY17	Total
Total ($M)	53	57	61	62	65	298

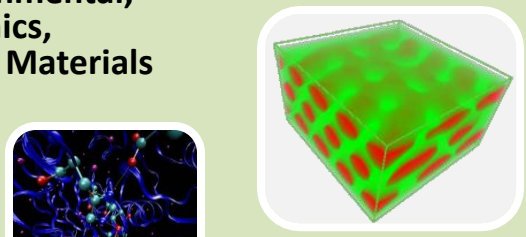
***PresBud Request FY13**

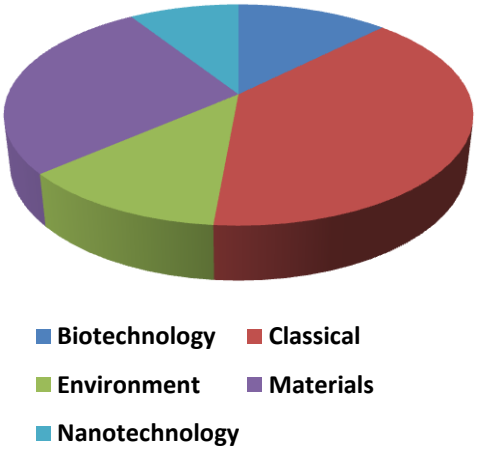
Material Centric Subportfolio FY 13-17

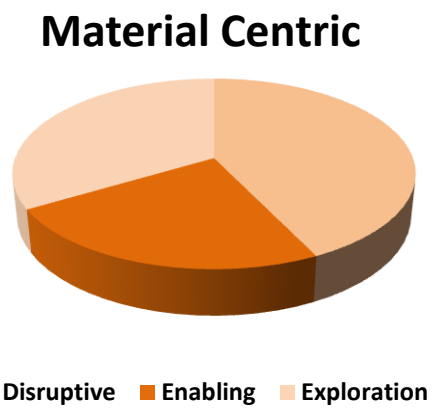
- **Classical Sciences**
  - Environmental
  - Chemical
  - Physical
  - Electronics and Photonics
  - Mechanical
  - Material
- **Materials**
  - National Advanced Energetics Initiative
  - Materials and Mechanics
  - Multi-Scale Modeling Efforts
- **Biotechnology**
  - Bio-inspired Sensing and Power
- **Nanotechnology**
  - Nano tech for the Soldier
  - Nanoelectronic Devices
- **Environmental Sciences**

Material Centric:

- **Classical Research in Environmental, Chemical, Physical, Electronics, Photonics, Mechanical, and Materials Sciences**
- **Materials**
- **Biotechnology**
- **Nanotechnology**
- **Environmental**





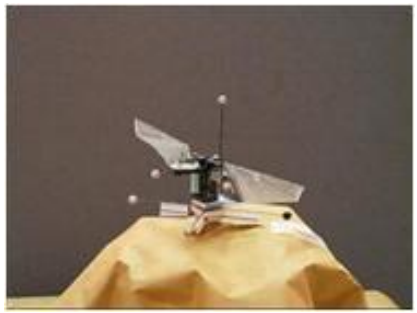


	FY13	FY14	FY15	FY16	FY17	Total
Total ($M)	155	161	162	167	172	816

*PresBud Request FY13

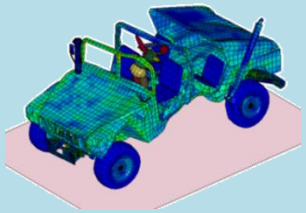
Platform Centric Subportfolio FY 13-17

- **Simulation**
  - High performance computing research
- **Autonomy**
  - Micro Autonomous Systems
  - Robotics
- **Vehicles**
  - Automotive Research
  - Vertical Lift Technology

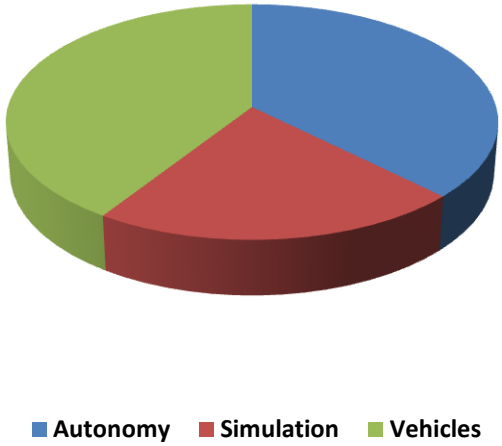


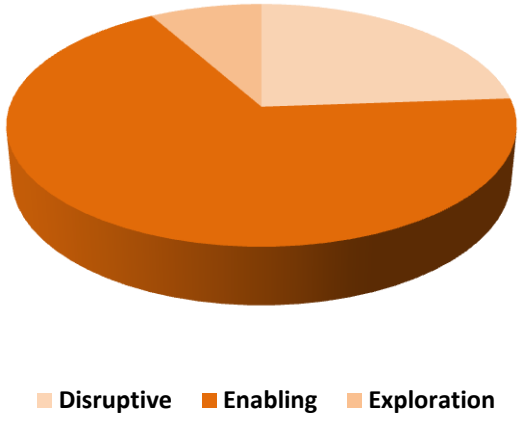
Platform Centric:

- Simulation
- Autonomy
- Vehicles



Platform Centric





	FY13	FY14	FY15	FY16	FY17	Total
Total ($M)	47	49	51	53	53	253

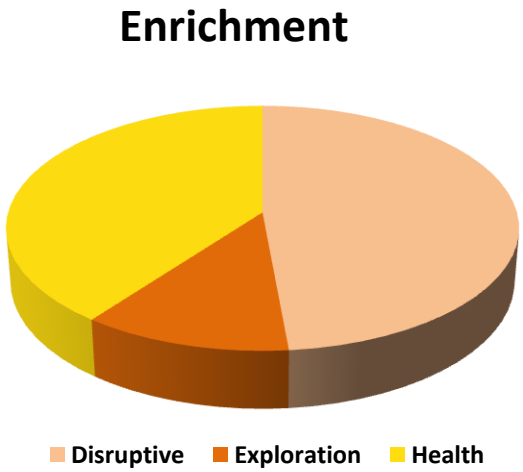
*PresBud Request FY13

Enrichment Initiatives Subportfolio FY 13-17

- **University Research Initiatives**
  - MURI
  - PECASE
  - DURIP
- **Innovative Lab Research**
  - Competitive ILIR
- **Educational Outreach and Diversity**
  - AEOP
  - HBCU/MI
- **International Technology Watch**
  - International Centers
  - Foreign Tech Assessment

Lab Enrichment:

- **University Research Initiatives**
- **Innovative Lab Research**
- **Educational Outreach and Diversity**
- **International Technology Watch**



	FY13	FY14	FY15	FY16	FY17	Total
Total ($M)	118	121	122	124	125	611

*PresBud Request FY13

S&T Program Development

S&T Prioritization

Focus of 2011 TRADOC/G8/ S&T Conference

Near Term
7 Big Army Problems
24 Challenges for S&T

Focus of May 2012 Basic Research Concept Exploration Workshop

Long-Term Army Problems
Long-Term Basic Research Challenges

Payoff/ Delivery

TECD Programs Addressing Top 9

TECD Programs Addressing Challenges 10-24

S&T Programs Addressing PEO Needs

Focus of S&T Planning for POM15

Focus of May 2012 TRADOC/G8/S&T Workshop

Leap-Ahead Technologies

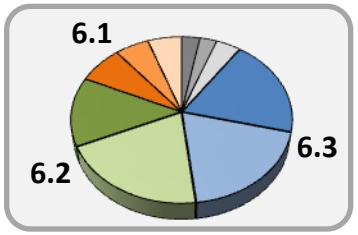
Basic Research Focus Areas

FY12 2015 2020 2025 2030

Funding

POM14

POM15

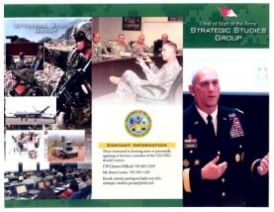


Notional Basic Research Strategic Model

Identified Army Problems

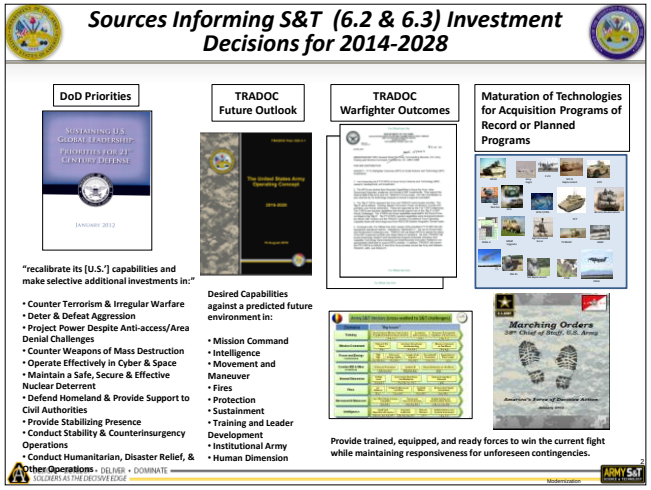
Defined Capabilities

Basic Research Workshop 2030



CSA SSG

Guidance Documents & Scenario Input



Validated//Revised Army Problems

Validated//Revised Future Challenges

Basic Research Opportunity Identification

Leadership Validation

Approved Portfolio Build Implementation Plan (goal is to achieve the "right" investment balance)

Program Development

Leadership Concurrence

Implementation

Define a set of priorities for Basic Research and identify challenge statements against which programs can be proposed and approved

Workshop Intent

Background

- The technical community is moving into an era of limited resources that will require a disciplined approach to managing science and technology (S&T) investments
- The Army's paramount commitment is to maintain a relevant portfolio focused on near, mid, and far-term advances that support Soldiers and small units
- History has shown that smart investments in basic science are vital to the future Army and the nation it protects

Objective

- Develop a set of problems and challenges, defining vectors for basic research
- Output from workshop will be used to create a presentation to be reviewed and ultimately briefed to the ASTAG in June

Approach

- SAAL-ZT is organizing a 2 day workshop on 1-2 May in the Washington, DC area
- Workshop will engage selected subject matter experts in a guided exercise
- Focus of exercise will be on likely Army operations in the 2030+ time frame
- Exercise will cover all Army S&T mission areas
- Exercise will provide input to SAAL-ZT in developing Basic Research Problems and Challenges

Workshop Methodology

- Workshop **opens with briefings** by experts on future trends shaping geopolitics, military operations, science, and technology
  - Purpose of these briefings is to immerse participants in the future and provide critical background knowledge for the wargame
- Participants will then **play through vignettes** covering the spectrum of operations, including offense, defense, and stability/support
  - A full spectrum approach is necessary to ensure that all Army S&T mission areas are addressed.
- During the scenario play participants will be **assigned to BLUE, RED, and WHITE Cells**.
- Game play will **follow a seminar wargame model**
- SAAL-ZT staff will complete an **initial analysis** to synthesize data and **generate emerging insights** that will be presented in an after action review with participants following the scenarios
- The raw game data, initial analysis, and AAR discussion will fuel an exploration and **analysis of technical barriers** to enhanced capabilities and the basic research issues associated with these barriers

Sample Vignette

VIGNETTE

Airborne Squad defends outer perimeter of a brigade airhead established inside Redland to support arrival of follow on forces using air landings by strategic airlift such as C-130, C-17s. Our presumption is that in 2030 these defenders would be a squad supported by fire from a main base and occasional aerial resupply by air. The units may operate autonomously for several weeks.

The mission is not only to scout and sense, but also to block enemy approaches to the airhead by calling on air and artillery support. The enemy knows their value and launches repeated human wave and cyber (counter-network) assaults. This vignette would tell the story of an airborne squad of 9 men fighting / occupying hastily fortified COP. They would be reinforced by a mortar, MI team, and a medic.

A sampling of what the vignette would allow:

- Sensing movement using 2030 technologies, both airborne and ground.
- Small arms defense against overwhelming odds.
- Hasty base construction and how these squad facilities might be used for intra-base maneuver
- Resupply of small units while under fire using latest precision air delivery (parachute or unmanned).
- Carry along equipment as well as equipment needed for extended basing for small units.
- Small unit medical support by an attached medic. What level of medical care would be available for such a unit?
- Static networks. What level of emplaced comms and sensor systems would such a unit require?
- Human Dimension: Human sensing at great distances amplified by technology. Isolation and palliation when fighting far from support.
- Unplugged combat. What happens when the enemy launches cyber attacks to jam, intercept, and spoof the network?
- Fighting in reduced visibility. What changes when the small unit is fogged in for extended periods?

Army Science & Technology

Providing Soldiers Technology Enabled Capabilities

MAINTAINING A LEADING EDGE IN TECHNOLOGY