NIST Big Data Public Working Group

Overview of NIST Big Data Interoperability Framework Volume 1

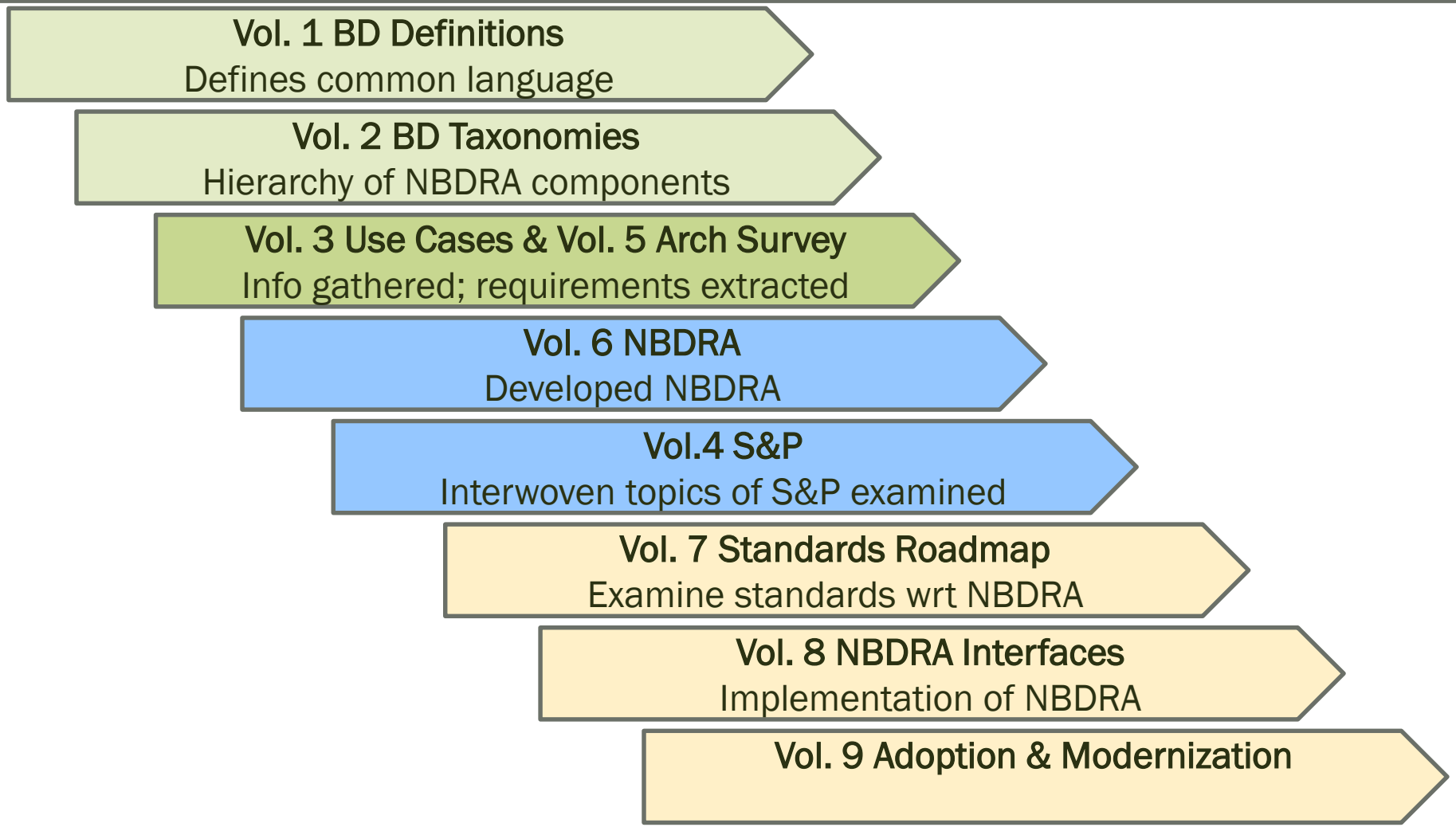
Dr. Nancy Grady
Chief Data Scientist
SAIC

NIST Campus
Gaithersburg, Maryland
June 1, 2017

Presentation Overview

- Volume Presentation Outline
- **Volume 1, Definitions (Nancy Grady, SAIC)**
- Volume 2, BD Taxonomies (Nancy Grady, SAIC)
- Volume 3, Use Cases and General Requirements (Geoffrey Fox, Indiana University)
- Volume 6, Reference Architecture (David Boyd, InCadence Corp.)
- Volume 4, Security and Privacy (Arnab Roy, Fujitsu; Mark Underwood, AVP, Strategic Initiatives, Controls and Countermeasures)
- Volume 8, Reference Architecture Interface (Gregor von Laszewski, Indiana University)
- Reference Architecture Software Implementation Environment and Demonstration (Gregor von Laszewski, Indiana University)
- Volume 7, Standards Roadmap (Russell Reinsch, Center for Government Interoperability)
- Volume 9, Adoption and Modernization (Russell Reinsch, Center for Government Interoperability)

NBDIF Volume Overview



Volume Presentation Outline

- For each volume
  - Scope of the volume
  - Brief recap of version 1
  - Highlights of version 2 accomplishments
  - Summary of version 2 areas needing contributions
  - Topics that could be considered for version 3

Volume 1, Definitions

Document Scope

- Define terminology used in community
- Define terminology used in the other volumes of the NBDIF
- Definition of Big Data, Data Science, and related terms
- Narrative description to add conceptual framework around Big Data terminology
- Provides vocabulary to clarify discussions surrounding Big Data
- Audience anyone who is:
  - New to Big Data to understand concepts
  - Want to be compliant with a common vocabulary
  - Need to evaluate vendor concepts

Volume 1, Definitions

Version 1 Overview

- Big Data and Data Science Definitions
  - *Big Data* consists of extensive datasets, primarily in the characteristics of volume, variety, velocity, and/or variability, that require a scalable architecture for efficient storage, manipulation, and analysis.
  - *Data science* is the extraction of useful knowledge directly from data through a process of discovery, or of hypothesis formulation and hypothesis testing.
  - Comparison to range of Big Data definitions that have been published

Volume 1, Definitions

Version 1 Overview (cont)

- Big Data Features – clarify what is in scope
  - Data types and metadata (not new)
  - Data records (Non-Relational Models *not NoSQL*)
  - Datasets
    - Distributed storage
    - Distributed computing
    - Resource Negotiation
    - Datasets in Motion (streaming data)
    - Data Science Lifecycle Model
  - Big Data Analytics (looking at V's)

Volume 1, Definitions

Version 1 Overview (cont)

- Areas introduced but not covered
  - Big Data Metrics
  - Big Data Security and Privacy
  - Data Governance
  - Big Data Engineering Patterns

Volume 1, Definitions

Version 2 Accomplishments

- Big Data
  - Volume, Velocity, Variety, Variability
- Expanded discussion of Big Data Engineering Frameworks
  - Horizontal infrastructure scaling
  - Scalable logical data storage
  - Relationship to other technological innovations
    - HPC, Cloud, IoT, Cyber-Physical Systems, Blockchain
- Reorganized the analysis of big data – i.e. Data Science
  - Veracity, Validity, Visualization, Value
  - Metadata, Data Types, Complexity, Latency
  - But not pre-existing cleanliness, completeness, etc

Volume 1, Definitions

Version 2 Accomplishments

- Expand Big Data Science novelty
  - Machine learning
  - Emergent Behavior
  - Data Scientists
  - Benchmarks
- Big Data security and privacy – still summary of Vol 4
- Management groundwork discussion and definitions
  - Orchestration
  - Governance
  - Data Ownership
  - Societal Implications

Volume 1, Definitions

Version 2 Opportunities for Contribution

- Concurrency definition and discussion (Section 3.1)
- Enhanced discussion of HPC (S3.3.1), Cloud (S3.3.2), IoT (S3.3.3), CPS (S3.3.4), Blockchain (S3.3.5)
- Latency: describe and relate to Big Data (S4.2.9)
- Emergent Behavior: description and relation to Big Data (S4.4)
- Data cleansing: describe and relate to Big Data (S4.3.1)
- Machine learning: describe and relate to Big Data (S4.3.3)
- Big Data Management (S6.0): discuss wrt Big Data and orchestration (S6.1), data governance (S6.2), and data ownership (S6.3)
- Pointers to external materials not covered here in detail
- References to parallel works by others

Volume 1, Definitions

Possible Version 3 Topics

- Categorization of Relational/NoSQL/NewSQL/etc attributes
  - To assist in implementation comparisons
- Metrics guidance
- Discussion of Visualization
  - Exploratory, Evaluative, Explanatory
  - Augmented Reality and Virtual Reality
- Expansion of Machine Learning/Deep Learning/Artificial Intelligence
- Algorithms and Analytics Frameworks
- Dedicated Languages ???
- Emerging topics - ???

Volume 1, Definitions

Breakout Plan

- Review Version 2 slide of remaining items
  - Do any need so much work they should be deferred to version 3
- What have we missed
- What is not needed or is poorly expressed
- Review of Version 3 slide
  - Anything that should be put in version 2
  - Anything missing