

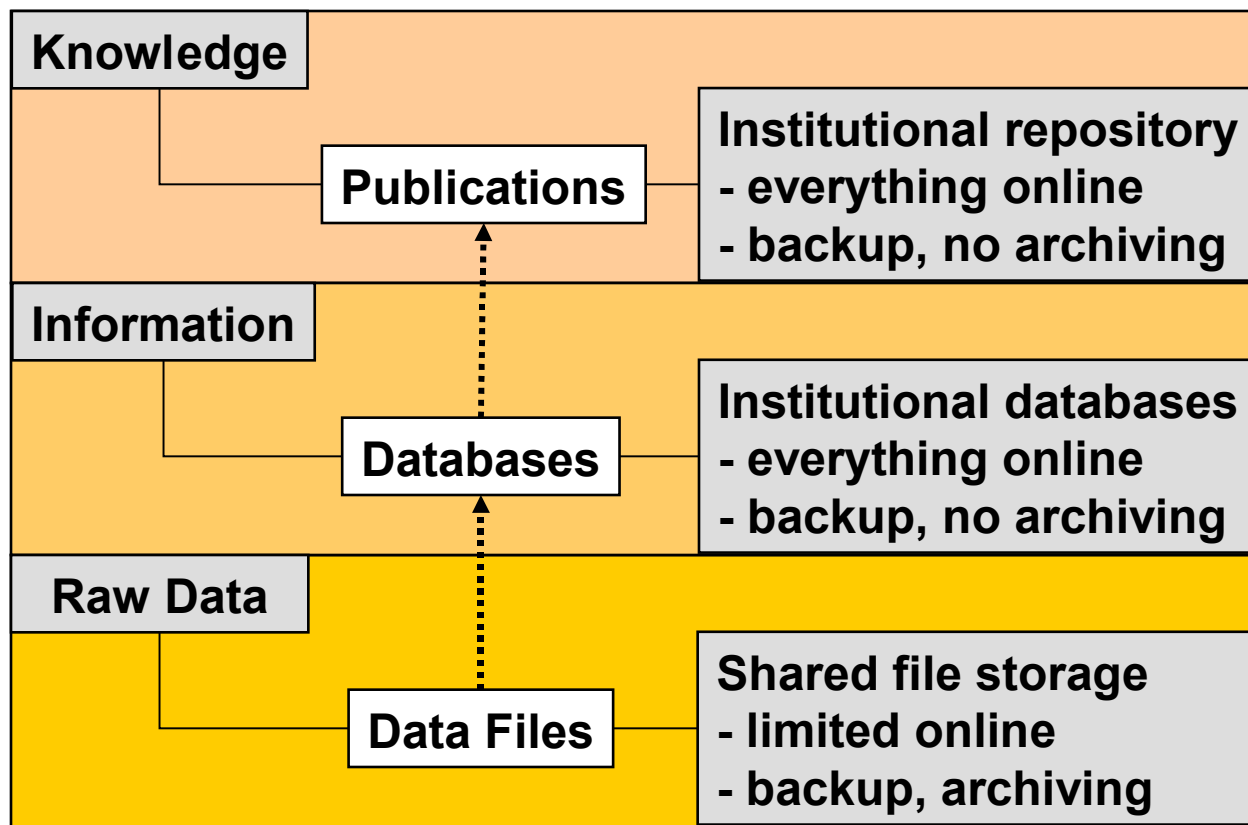


**Research
Data / Information / Knowledge
Management**

Climbing Mount Everest

Data, Information and Knowledge

- managing digital objects -



Storage
space

Long-term
value

Data, Information and Knowledge

- example: genotyping -

- Knowledge
 - paper
- Information
 - genotype data
- Data
 - gel images



Plate_Well	Locus	Dye	Allele1	Peak1	Qual1	Volume1	Allele2	F
Azu	RM118	700	175	175.5	200	655350		
Azu	RM118	800	175	175.5	200	272158		
Azu	RM118	700	177	182.5	200	289936	181	
lr64	RM118	700	181	180.1	200	655350		
lr64	RM118	800	181	0	200	0		
lr64	RM118	700	179	180.2	88	655350		
lr64	RM118	700	181	181.6	74	655350		
lr64	RM118	800	179	180.3	89	655350		
Lth	RM118	700	179	179.7	200	655350		
Lth	RM118	800	179	180.8	200	655350		
Plate1-A01	RM118	700	177	177.5	200	655350		
Plate1-A02	RM118	700	181	168.8	200	619936		
Plate1-A03	RM118	700	181	168.9	200	400876		
Plate1-A04	RM118	700	177	178.8	200	655350		
Plate1-A05	RM118	700	177	179.6	200	655350	181	
Plate1-A06	RM118	700	181	168.1	200	287864		
Plate1-A07	RM118	700	177	178.2	200	655350		
Plate1-A08	RM118	700	177	178.2	200	655350		
Plate1-A09	RM118	700	177	178.6	200	655350		
Plate1-A10	RM118	700	181	181.2	200	655350		
Plate1-A11	RM118	700	181	181.5	200	655350		
Plate1-A12	RM118	700	177	177.9	200	655350		
Plate1-B01	RM118	700	181	180.7	200	655350		
Plate1-B02	RM118	700	181	168.1	200	346142		
Plate1-B03	RM118	700	181	181.4	200	655350		
Plate1-B04	RM118	700	181	181.1	200	655350		

Harnessing molecular markers in hybrid rice commercialization in the Philippines

C.O. Redoña, L.M. Parra, L.R. Nipote, V.C. Cae, I.A. Pacada, L.M. Doñias, R.O. Solis, S.A. Ordóñez, and J. Aparicio

In 2002, commercialization of hybrid rice technology became Philippine agriculture's banner program for attaining self-sufficiency and increasing productivity and profitability in rice, and generating rural employment. Four public hybrids (Magat, Matizo, Matizo 2, and Matizo 3) and four proprietary hybrids—Mágitas (Moranito), SL8 (SL Agritech), Gigante (Bayer CropScience), and Rinsinta 28 (Hyflaco)—were made available to farmers. With intensified training efforts, 40 seed growers' cooperatives were formed that produce 60–70% of the program's seed requirements. From 2001 to 2003, hybrids yielded 6.03 t ha⁻¹ versus the 4.44 t ha⁻¹ average for certified inbred seeds. Average seed production yields increased from 300 kg ha^{-1} in 2001 to 754 kg ha⁻¹ in 2003.

Philippine hybrids are developed using the three-line approach involving cytoplasmic male sterile (CMS) lines, and the two-line system using temperature-sensitive genetic male sterile (TMS) cultivars as female parents. Biotechnology has been applied to fast-track breeding of improved CMS and TMS lines. Biotechnology tools used at PhilRice, the lead public institution for rice research and development in the country, have been molecular marker technology, genetic engineering, and in vitro culture. This paper summarizes research undertaken using molecular marker technology.

Genetic characterization of hybrid parental lines

To widen the genetic diversity of Philippine hybrid rice germplasm, thus avoiding genetic uniformity in commercialized hybrids while increasing the likelihood of developing heterotic combinations, the diversity of PhilRice CMS germplasm has been assessed using molecular markers. The nuclear genome diversity of 22 CMS lines from PhilRice, the International Rice Research Institute (IRRI), and China was discriminated into nine groups based on 20 microsatellite loci, 25 RAPDs, and 10 +3*3 AFLP primer combinations (Fig.

1A) (Redoña et al. 1998). More recent analysis using 37 microsatellite loci and 46 currently used CMS lines, including 10 from the previous study, revealed eight clusters of at least 25% genetic similarity (Fig. 1B).

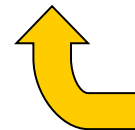
In another study, four maintainers (B) and three TMS lines of PhilRice were separated from the B and TMS lines of IRRI at a 58% and 52% level of similarity, respectively, based on 64 microsatellite loci (Fig. 1C,D) (Parra 2006). Among maintainers and CMS lines, genetic similarity coefficients ranged from 0.22 to 0.71 based on another study using 65 microsatellite loci (Ordóñez 2003). These results suggest the existence of distinct nuclear genetic backgrounds in the germplasm used and conscious efforts are made to breed hybrids with genetic backgrounds different from those already commercialized.

Parental genetic diversity and heterosis

Genetic divergence of parents is thought to be related to heterosis or hybrid vigor. Thus, molecular marker-assisted genetic variation may potentially be useful for predicting hybrid performance, thus increasing breeding efficiency.

Based on 43 microsatellite loci from the 12 rice chromosomes, the nature and extent of correlations between microsatellite marker heterozygosity and heterosis for some quantitative traits was investigated in 48 three-line and 13 two-line rice hybrids. Results revealed heterozygosity and heterotic performance (measured as the superiority over the male parent) to be significantly correlated at the 0.01 probability level for the number of productive tillers per plant ($r = 0.41^{**}$) and leaf area index ($r = 0.39^{**}$) while grain yield ($r = -0.30^{*}$) was correlated with heterosis at the 0.05 probability level in the three-line hybrids. SSR heterozygosity in the two-line hybrids ranged from 0.43 to 0.66, suggesting a moderate extent of genotypic divergence among the parental cultivars. Heterotic

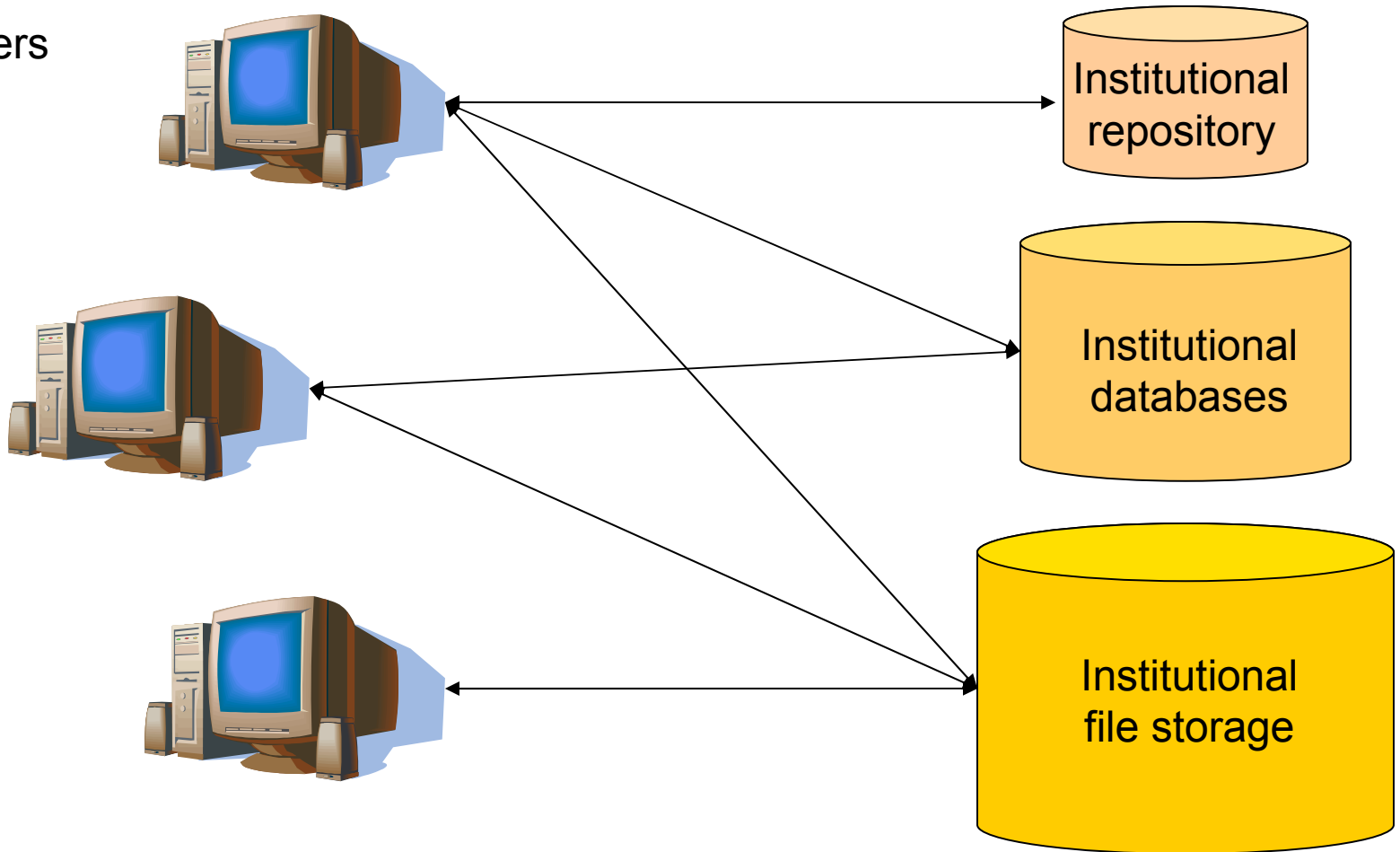
166 Rice: the scientific perspective for the 21st century



Repository, Databases, File Storage

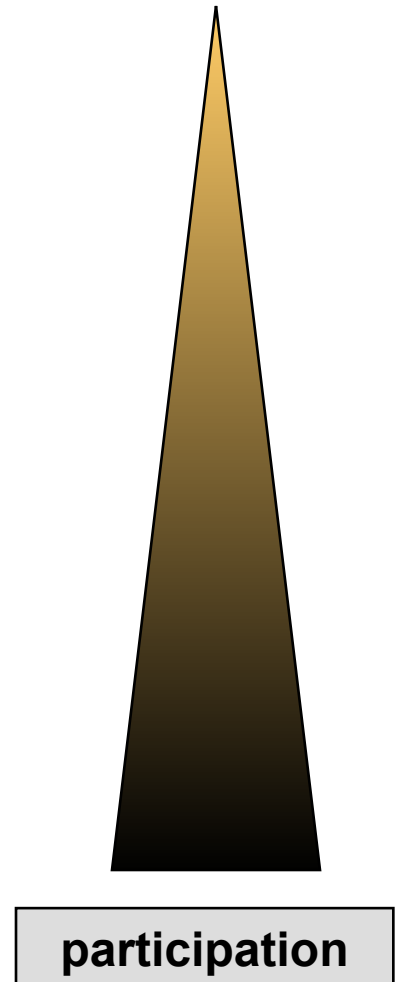
- user access -

IRRI users

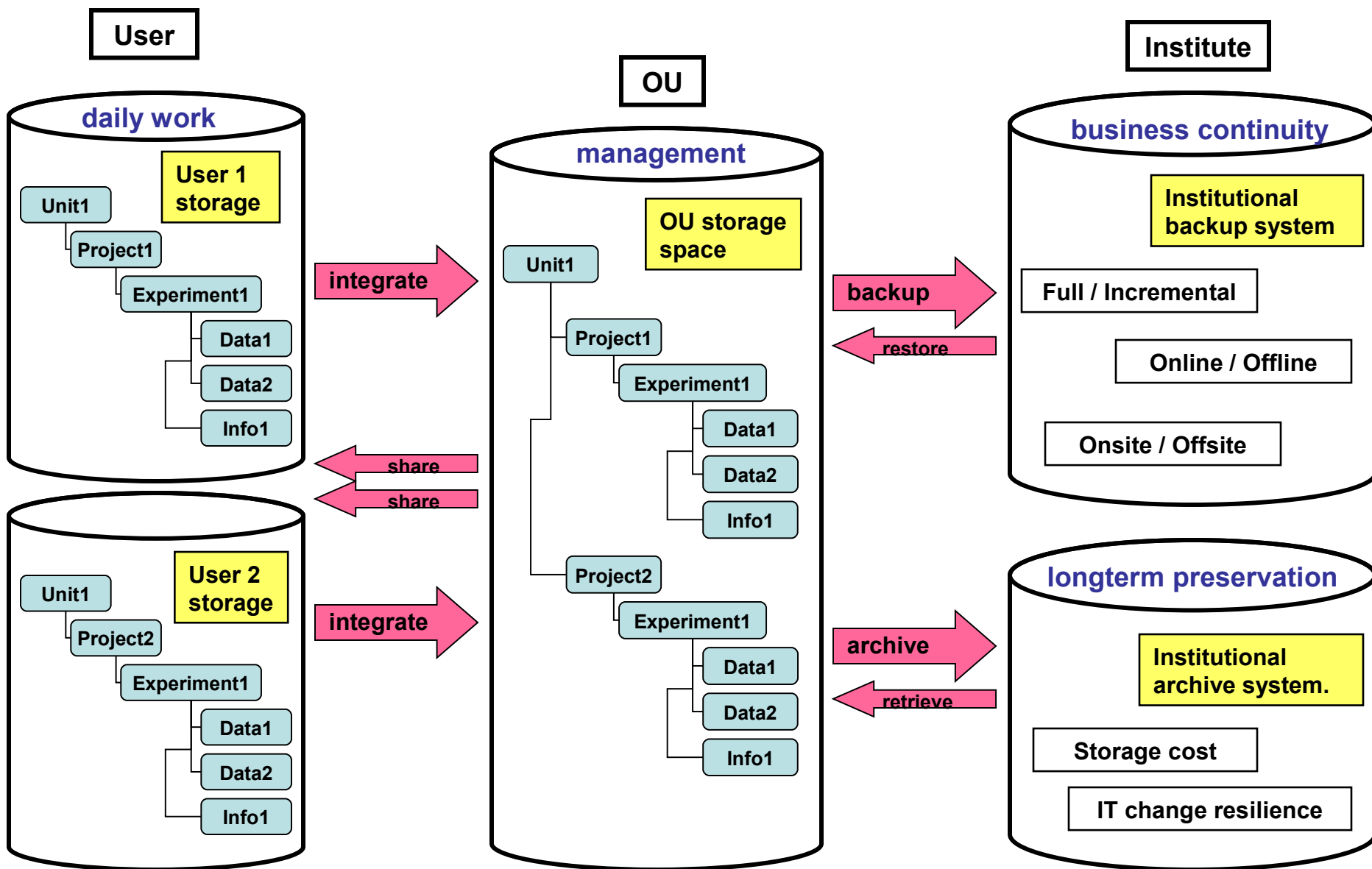


Repository, Databases, File Storage - participation -

- Institutional Repository
 - Dedicated user interface
- Institutional Databases
 - Dedicated user interface
 - Generic database frontend
 - Programmatic access
- Institutional File Storage
 - File manager
 - Backup system

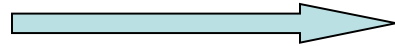
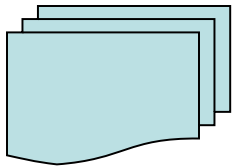


File System Integration, Backup, Archive

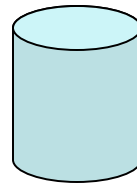


Data Management Pipeline

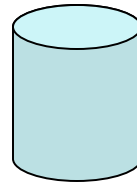
Excel spreadsheets
conforming to
database tables



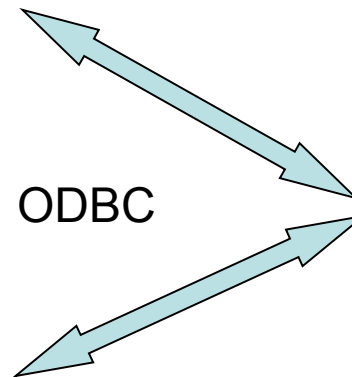
MS Access
User frontend



copy & paste

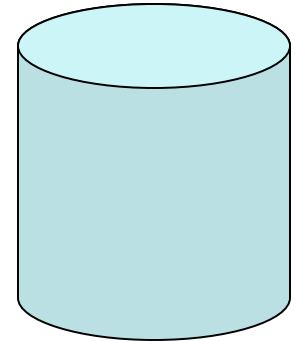


Linked tables
Queries
Reports
Forms



ODBC

Institutional
Databases
PostgreSQL

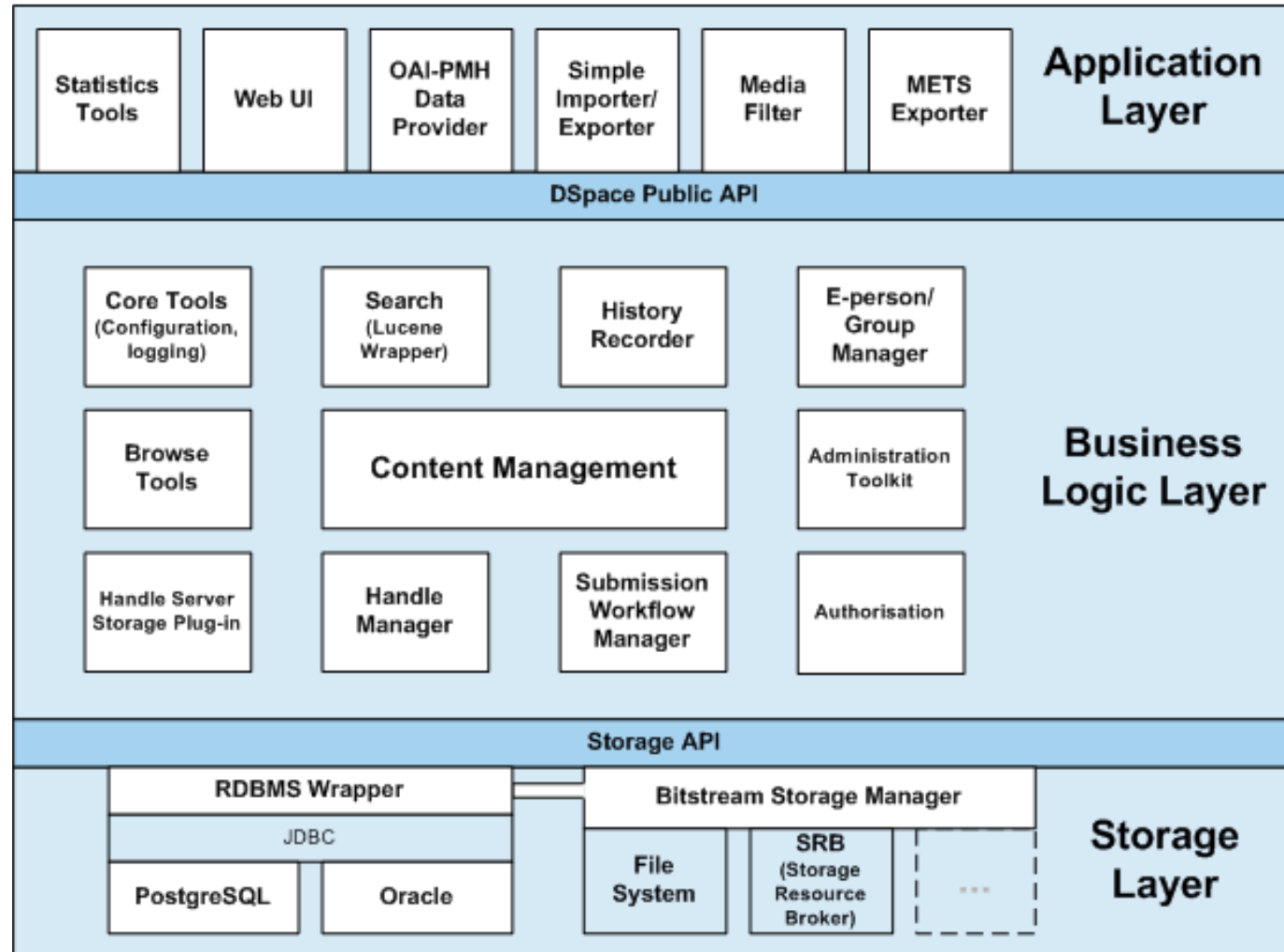


Data capture
Spreadsheet
functionality

Schemas
Views
Permissions

Institutional Repository (DSpace)

- Articles and preprints
- Technical reports
- Working papers
- Conference papers
- E-theses
- Datasets: statistical, geospatial, matlab, etc.
- Images: visual, scientific, etc.
- Audio files
- Video files
- Learning objects
- Reformatted digital library collections



Summary of Framework

- Institutional repository
 - Complete system. Few staff need to learn how to manage content. Everyone should know how to search and retrieve.
- Institutional databases
 - Pipeline of familiar software. Disciplined use of spreadsheets. DB capacity needed at the OU level. Few staff per OU need to be trained.
- Data files
 - Integrated file system at OU level. Managed at OU level. Naming conventions and directory structures needed. Everyone needs to participate.