## Index

\( \theta \)-join, A-7, A-10

nary integration, 147

2PC, see two-phase commit

2PL, see two-phase locking

3NF, A-5

3PC, see three-phase commit

abort, C-4, C-38

abort list, C-46

access control, 91, 102

access path, 23

access path selector, 23

ACID properties, 183, C-9

ACID transaction, 138

action model, C-14

activation queue, 517

activity, C-19

ad-hoc data delivery, 6

AdaptCache, 80

adaptive query processing, 172

adaptive reaction, 173

adaptive virtual partitioning, 379

affix, 287

after image, C-43

aggregate assertion, 121

aggregate constraint, 177

algebraic query, B-9

algebraic query/see query

allocation, 33, 43, 49, 51, 67, 69, 72, 73, 84, 85

Amazon Redshift Spectrum, 536

Amazon SimpleDB, 506

Ambari, 496

analytical graph query, 473

analytical graph workload, 473

anomaly serializability, C-13

AP, see asynchronous parallel

Apache Flink, 471

Apache Giraph, 484

Apache Ignite, 517

Apache Storm, 458

APP, 499

application server, 23

apprentice site, 163

Aurora, 458

Amazon Redshift, 466

AURORA data integration system, 281

Aurora DSMS, 458

attribute, A-1

attribute affinity matrix, 55

attribute affinity measure, 54

attribute usage value, 54

atomicity, C-9

atomic commit, 208

atomic operation, C-7

atomic operation, 471

atomic operation, 517

atomic operation, 208

atomicity, C-9

Aurora, 458

AURORA data integration system, 281

Aurora DSMS, 458

authorization, 21

authorization matrix, 104

Auto-Detect, 588

autonomy, 18

communication, 303

design, 303

execution, 303

Autoplex, 290
Index

committable state, 223
communication cost, 132
communication links, D-7
communication time, 136
complexity of relational algebra operators, 132
  B-14

composite matching, 291
concurrency control, 183, 235  C-22
  locking, 186, 187
  optimistic, 186
  pessimistic, 186
  timestamp ordering, 136
  concurrency level, 136
conditional data delivery, 6

  conflict, 136
  read-write, 136
  write-read, 136
  write-write, 136
conflict equivalence, C-26
conjunctive normal form, B-4
conjunctive query, 306
connection graph, 135  B-6
consistency, C-10  C-22
  degree 0, C-10
  degree 1, C-10
  degree 2, C-10
  degree 3, C-10  C-26
  strong, 124
  weak, 124
consistent hashing, 504
constraint-based matching, 288
containment edge, 289
contingency task, C-20
continuous processing model, 458
continuous query, 152

Continuous Query Language, 461  498
coordinator timeout, 217
Cosmos DB, 517
Cost Functions, 155  B-18
Cost Model, B-18

cost model, 8
  85, 130  133
  167, 175  176
  264
  312  317
  322
  328
  366
  363
  364
  367
  369
  380
  382
  531
  534
  536
  537
  538
  539
  542
  543
  545
  544

Couchbase, 509  535
CouchDB, 509
COUGAR, 460  499
counting algorithm, 98
CPU cost, 132
CQL, 510
crash recovery, C-9
crashing, 563
crawling, 564
cryptocurrency, 424

CSMA/CD, see carrier sense medium access
  with collision detection

cyclic query, 152
cursor stability, C-12
Cypher, 513  515

DaaS, see Database-as-a-Service, see
  Database-as-a-Service
dark web, 5
  539
DAS, see directly attached storage
data center, 29
data cleaning, see also data quality, 438  567
  instance-level, 301
  schema-level, 301
web, 555
data control, 14  91

data dictionary, 83
data directory, 83
data distribution, 15
data encryption, 102
data fusion, 587  594
data independence, 8
logical, 8
physical, 8

data integration, 279  496  497
web, 566
data lake, 5
  277  325  493
  500  567
  585
data locality, 11  35
data localization, 33
  127
  134
  136
  138
  175

325
data partitioning, see also fragmentation, 8 see also fragmentation, 11
  11
  24  73
  80
  84
  85
  239
  349
  351
  380
  381
  584
workload-aware, 74  78

data processor, 225  346
data protection, 102
data quality, 17
  17
  190
  191
  197
  198
  585
web, 562
  see also data cleaning, 585

data replication, 243
data skew, 73  366
data spaces, 567
data stream, 458  460  498
data stream management system, 458
data stream processing system, 458
data transfer rate, D-7
data translation, 299
data veracity, 585
data warehouse, 278, 293, 301, 493
database administrator, 91
database buffer manager, 24
database categorization, 565
database cluster, 374
database consistency, 15, 110, 181, 183, C-1
database cracking, 81, 86
database integration,
  logical, 277, 278
  physical, 277
database integrity, 91
database log, C-41
database recovery, C-14
database replication, 1243
database selection, 566
database server, 21
Database Statistics, 157, B-19
database statistics, B-3
DataGuide, 553
DataLog, 305, 306, 400
DB2 BigSQL, 495
DBA, see database administrator
DBpedia, 573
deadlock, C-34
  avoidance, 15, C-36
  centralized detection, 192
  detection, 15
  detection and resolution, 191, C-37
  distributed detection, 193
  global, 191
  hierarchical detection, 195
  prevention, 15, C-35, C-37
  deadlock management, C-39
decision tree, 290
decomposition, B-25
deep web, 539, 592
degree distribution skew, 486
deletion anomaly, A-4
demand paging, C-40
dependency conflict, 283
dependency preservation, A-4
detachment, 139, B-25
deterministic search strategy, B-17
differential file, C-44
differential relation, 97
DIKE, 290, 327
DIPE, 327
directly attached storage, 350
dirty read, C-12
disjointness, 37
disjunctive normal form, B-4
distributed computing system, 2
distributed concurrency control, 228
distributed deadlock, 191
distributed directory, 91
distributed execution monitor, 23
distributed hash table
  replica consistency, 417
distributed join, 23
distributed query, 127
  dynamic optimization, 128, 133, 134
  execution, 133, 137
  execution plan, 134
  hybrid optimization, 128
  optimization, 136
  static optimization, 128, 163
distributed query processing, 14
distributed recovery protocols, 10
distributed reliability, 10
distributed storage system, 439
distributed transaction, 58
distributed transaction log, 231
distributed transaction manager, 23
division operator, A-7, A-14
Document Type Definition, 571
domain, A-1
domain constraint, 112
domain relational calculus, A-16, A-17
domain variable, A-17
DSMS, see data stream management system, 458
DSPS, see data stream processing systems, 458
DSS, 367, 471, see data stream system
DTD, see Document Type Definition
durability, C-14
dynamic buffer allocation, C-40
Dynamic distributed query optimization, 159
dynamic programming, B-17, B-27
dynamic query optimization, B-2, B-3, B-24
DynamoDB, 434, 492, 503, 534, 535
E-R model, 281, 329
Eddy, 328
DSS, 367, 471, see data stream system
data stream processing systems, 458
data stream system
document type definition
durability, C-14
dynamic buffer allocation, C-40
dynamic distributed query optimization, 159
dynamic programming, B-17, B-27
dynamic query optimization, B-2, B-3, B-24
DynamoDB, 434, 492, 503, 534, 535
E-R model, 281, 329
Eddy, 328
data stream processing systems, 458
data stream system
document type definition
Eddy, 328
edge-centric asynchronous, 492
de-centric graph model, 481
edit distance, 287
eDonkey, 432
Edutella, 397, 400, 433
elastic scalability, 443
elasticity, 28
element-level matching, 284, 285, 288
elimination of redundancy, B-8
entity-relationship data model, 281
epidemic protocol, 391
equijoin, A-11
Esgyn, 518
Estocada, 528, 529, 533
Etherum, D-5
Ethernet, 428, 430
ETL, see Extract-Transform-Load,
Estocada, see Extract-Transform-Load, see Extract-Transform-Load, see Extract-Transform-Load
failover, 434, 435, 437, 439, 441, 442
failure, 15
communication, B-2
hardware, C-38
media, C-39, C-49
site, C-38
software, C-38
system, C-38
failure transparency, 10
failures of commission, 236
failures of omission, 236
federated database systems, 16
fetch-as-needed, 164, 177
file allocation, 67
file storage, 440
first normal form, A-5
fix/flush, 231, 233, 234, 235
fix/no-fix decision, 231, 233, 234, 235
fix/no-flush, C-47
Flink, 498
FlumeJava, 498
flush/no-flush decision, C-45
Flux, 498
force/no-force decision, C-45
forcing a log, C-45
foreign key constraint, 112
Forward, 521, 523, 533, 536
fragment, 13, 36, 37, 41, 43, 45, 50, 52, 53, 62, 71, 73, 78, 80, 89
fragment-and-replicate, 161, 356
fragmentation, 8, 13, 33, 35, 37, 41, 43, 48, 52, 54, 55, 65, 66, 68, 72, 73, 84, 87, 89, 351
completeness, 36
derived horizontal, 37, 48
disjointness, 56
hash, 75
horizontal, 35
hybrid, 35
nested, 35
primary horizontal, 37, 40
range, 74
reconstructability, 35
round robin, 73
vertical, 35
fragmentation predicate, 41
Freernet, 588
full reducer, 152
fully decentralized top-k, 408
fully duplicated, see fully replicated
fully duplicated database, see fully replicated database
fully replicated database, 13, 67
functional dependency, A-4
functional dependency constraint, 112
fusion table, 567
fuzzy read, C-15
gap recovery, see at-most-once semantics
Garlic, 519
GAS, see gather-apply-scatter, see gather-apply-scatter
gather-apply-scatter, 451, 482
asynchronous, 451
edge-centric, 492
partition-centric, 492
vertex-centric, 492
GAV, see global-as-view, see global-as-view, see global-as-view
GCS, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema, see global conceptual schema
general constraint, 112
geo-distributed DBMS, see geographically distributed DBMS
geo-distributed DBMS, 2
GFS, see Google File System, see Google File System, see Google File System, see Google File System
GFS2, see Global File System 2
Gigascope, 458, 499
Giraph, see Apache Giraph
Giraph++, 490
GiraphUC, 488
GLAV, see global-local-as-view
Index

Linked Open Data, 567, 568, 584, 593
load balancing, 564
local area network, D-3, D-4
local conceptual schema, 23, 277
local directory/dictionary, 85
local history, C-27
local query, 137
local query optimizer, 23
local recovery manager, 23, 184
Local Relational Model, 398
local wait-for graph, 191, 192
local-as-view, 279, 305, 306, 308, 326, 399
lock, C-28
  logical, C-28
  manager, C-30
  mode, C-29, C-32
  point, C-31
  unit, C-28
lock mode, 187
lock table, 187
locking, 15
locking algorithm, C-28, C-29
locking granularity, C-28
LOD, see Linked Open Data, see Linked Open Data
log, 183
  stable, 184
  volatile, 184
log buffer, C-43
logical link control layer, D-12
Lorel, 550, 593
lossless decomposition, A-4
lost update, C-12, C-23
LRM, see Local Relational Model
LSD, 290, 291
Lucene, 517
machine learning, 438, 473
MADMAN, C-36
MAN, see metropolitan area network
  map function, 443
  map-only join, 451
  mapping creation, 293, 299
  mapping maintenance, 293, 299
MapReduce, 499, 509, 524, 529, 534, 535, 536, 592
mashup, 567
master site, 159, 163
materialization program, 136
materialized view, 96, 98, 100, 102, 121, 123
  300, 361, 525, 529, 536
  maintenance, 96, 123, 278
Maveric, 300
maximally-contained query, 309
MDBS, see multidatabase system, see multidatabase system, see multidatabase system, see multidatabase system, see multidatabase system
  mediated schema, 25, 277, 278, 281, 293
  mediator, 25, 503
  mediator/wrapper architecture, 25
  mediator/wrapper architecture, 303, 304, 316
  medium access control layer, D-12
  Memcached, 506
  MemSQL, 518
  merge-join, B-29
  metadata, 83
  metasearch, 548, 564, 566, 592
  METIS, 376, 478
  metropolitan area network, D-3, D-4
  MillWheel, 458, 471
  MinCon algorithm, 309, 310
  minterm fragment, 42, 45
  minterm predicate, 39, 47, 52, 55
  minterm selectivity, 40
  MISO, 536
  mixed fragmentation, 66
  Mizan, 45, 500
  MonetDB, 126
  MongoDB, 509, 534, 535
  monotonic query, 461
  Mulder, 559, 593
  multi-point network, D-6
  multi-tenant, 29
  multicast, D-6
  multidatabase, 17, 312, 319
  multidatabase query optimization, 311
  multidatabase query processing, 302
  multidatabase system, 16, 25, 277, 279, 302
  529
  multigraph, 472
  multi-query optimization, 466
  multi-valued dependency, A-4
  multiversion concurrency control, 200
  mutual consistency, 14
  MVCC, see multiversion concurrency control
n-gram, 287
n-way partitioning, 63
N1QL, 509
NAS, see network-attached storage
  natural join, A-7, A-11
  negative tuple, 465
Neo4J, 534, 535
Neo4j, 513, 516
nested fragmentation, 66
nested loop join, 462, B-28
Network File System, 349
network layer protocol, D-9
network partitioning, 15, 206, 224
    multiple, 224
    simple, 224
network protocol, D-7
network-attached storage, 349
neural network, 290
NewSQL, 3, 29, 501–503, 517–519, 534–537
NewSQL system, 501
NFS, see Network File System
no-fix/flush, C-46
no-fix/no-flush, 230, C-46
no-force/no-steal, C-47
no-steal/force, C-48
non-commitment state, 223
non-null attribute constraint, 112
non-replicated database, 13, 67
non-uniform memory architecture, 347, 381
    cache coherent, 348
nonce, 429
NonStop SQL, 190
normal form, A-4
    Boyce-Codd, A-4
    fifth, A-4
    first, A-4
    fourth, A-4
    second, A-4
    third, A-4
    normalization, A-3
NoSQL, 2
    5, 17, 20, 29, 69, 350, 438, 439, 443
    496, 501, 503, 507, 510, 517, 519, 521
    523, 525, 532, 537
    multimodel, 517
    NoSQL system, 501
    NoSQL, 16
    NuoDB, 518
Object Exchange Model, 549
object storage, 440, 442
object store, 440
OceanStore, 421
Odyssey, 532, 536
OEM, see Object Exchange Model, 592
OLAP, see On-Line Analytical Processing,
    see On-Line Analytical Processing
On-Line Analytical Processing, see
    On-Line Analytical Processing
    On-Line Analytical Processing
    On-Line Analytical Processing
    On-Line Analytical Processing
    On-Line Analytical Processing
    On-Line Analytical Processing
    On-Line Analytical Processing
    On-Line Analytical Processing
    on-line graph query, 473
    online graph workload, 473
    online graph workload, 473
    on-line transaction processing, 286
    operation, C-7
    operation conflict, C-7
    operational logging, C-43
    operator tree, [18] [360] B-9 B-15
    optimistic concurrency control, [14] C-28 C-34
    Oracle NoSQL, 595
    ordered shared locking, C-32
    OrientDB, 517, 534
    out-of-place updating, C-41
    outer join, A-7 A-10 A-12
    overlay network, 388 394
    pure, 388
P-Grid, 421, 422, 434, 435, 433
P2P, see peer-to-peer system, see peer-to-peer,
    see peer-to-peer, see peer-to-peer, see peer-to-peer,
    see peer-to-peer, see peer-to-peer
    see peer-to-peer, see peer-to-peer, see peer-to-peer
    see peer-to-peer, see peer-to-peer, see peer-to-peer
    see peer-to-peer, see peer-to-peer
    see peer-to-peer, see peer-to-peer
    See peer-to-peer, see peer-to-peer, see peer-to-peer
    see peer-to-peer, see peer-to-peer, see peer-to-peer
    see peer-to-peer, see peer-to-peer
    PaaS, see Platform-as-a-Service, see Platform-as-a-Service,
    see Platform-as-a-Service
    see Platform-as-a-Service
    see Platform-as-a-Service
    packet, D-7
    packet switching, D-8
    PageRank, 490 491 493 496 497 498 499
    PageRank, 481 482 483 484 485 486 487
    parallel architecture, 345
parallel associative join, 413
parallel DBMS, 3, 16
parallel hash join, 355, 357, 413
parallel merge sort join, 355
parallel nested loop join, 355
parallel query optimization, 360
partial function evaluation, 584
partial key grouping, 468, 499
partial redo, C-46
partial undo, C-46
partially duplicated, see partially replicated partially duplicated database,
see partially replicated database
partially replicated database, 13, 67
participant timeout, 218
partition-centric asynchronous, 491
partition-centric BSP, 490
partition-centric graph model, 381
partitioned database, 13, 67
partitioning, 33, 62
path expression, 550
Paxos, 227, 429
basic, 229
pay-as-you-go integration, 567
peer-to-peer, 17, 385
data management, 385
hierarchical structured, 433
pure, 388
replication, 417
structured, 387, 388, 391, 414, 419, 422, 435
superpeer, 395, 412, 435
unstructured, 387, 388, 391, 400, 408
435
peer-to-peer computing, 16
peer-to-peer DBMS, 22
peer-to-peer system, 19, 23, 24
PeerDB, 400
Pentaho, 495
periodic data delivery, 6
persistent query, 458
pessimistic concurrency control, 14, C-28
PGrid, 398
phantom, C-6, C-13
phantom read, see phantom
PHI, see parallel hash join
PHORizontal, 44
PHT, 395
physical layer, D-12
Piazza, 398
PIER, 413
PIERJoin, 413
Pig Latin, 448, 498
pipeline parallelism, 12
pipelined symmetric hash join, 463
PIW, see publicly indexable web
PKG, see partial key grouping, see partial key grouping
PlanetP, 408
planning function, 319
Platfora, 495
Platform-as-a-Service, 5
PNL, see parallel nested loop join
point-to-point network, D-6
Polybase, 525, 526, 533, 535, 536
Polystore, 501
polystore, hybrid, 529, 536
loosely-coupled, 521, 536
tightly-coupled, 525, 536
posttest, 114
PoW, see Proof of Work, 430
Power BI, 495
PowerLyra, 479
precise recovery, see exactly-once semantics
precondition constraint, 112
predefined constraint, 112
predicate calculus, A-7
prefix hash tree, 415
Pregel, 483, 484, 500
Pregelix, 484, 500
pretest, 114
primary key, A-2
prime attribute, A-2
projection operator, A-7, A-8
projection-join dependency, A-4
Proof of Work, 430
property graph, 472
property table, 579, 593
protocol, D-9
publicly indexable web, 539, 562
publish/subscribe system, 460
punctuation, 463, 498
push-based system, 489
QoX, 524
Qox, 521
query
algebraic, 127
distributed, 25
execution plan, 131
query analysis, B-5
query decomposition, 134
query execution, 305, 322
query execution plan, B-14
query graph, 135
query modification, 93
query normalization, B-3
Index

query optimization, 127
  dynamic, 133
  static, 133
query processing, 127
query processor, 127, 345, B-1
query rewrite, 304
  using views, 309
query rewriting, B-9
query translation, 305, 322
question answering system, 558
quorum, 229
quorum-based voting protocol, 270
R*, 177, 190
Raft, 536
randomized search strategy, B-17
randomized strategy, B-3
range partitioning, 512
range query on P2P systems, 414
ranking, 543, 547
RavenDB, 509
RDD, see resilient distributed dataset
RDF, see Resource Description Framework, 133, 592, 594
RDF triple, 579, 593
RDF-3X, 579, 593
reachability query, 473
read lock, C-29
read quorum, 270
read-one/write-all available protocol, 268
read-one/write-all protocol, 269
read-on/write-all protocol, 249, 269, 270
reconstruction, 15
recovery, 15, 152, C-1
recovery manager, C-20
recovery protocol, 207, 221
Redis, 506
redo/no-undo, C-47
reduce function, 443
reducer, 149, 151
reduction technique, 138
referential edge, 290
referential integrity, 52
relation, A-1
  cardinality, A-2
  degree, A-2
  instance, A-2
schema, see schema
relational algebra, A-6
relational calculus, A-6
relational database, A-1
relevant simple predicate, 43
reliability, 10, 15
reliability protocol, C-39
replication join, 451
repetition anomaly, A-3
replicated database, 13
replication, 10, 15, 28, 29, 442, 471
P2P, 417
Research Description Framework, 572
resiliency, 132, C-1
resilient distributed dataset, 555
Resource Description Framework graph, 472
schema, 569, 573
resource description framework graph, 574, 575, 577, 582, 584
response time, 132, 155, 156, B-18
revision tuple, 460
Riak, 506
right-deep tree, 362
ring network, D-5
rollback, C-4
rollback recovery, see at-least-once semantics
round-robin partitioning, 468
routing, 13-6
ROWA, see read-one/write-all protocol
ROWA-A, see read-one/write-all available protocol
SaaS, see Software-as-a-Service
SAN, see storage area network
SAP HANA, 518
Sawtooth, 431
Sawzall, 448, 498
scale-out architecture, 13
scale-up, 11
scheduler, see history scheduler
schema, 2, A-1
  heterogeneity, 285
  adaptation, 299
  generation, 279
integration, 293
integration, binary, 291
integration, nary, 291
mapping, 281, 283, 293
matching, 281, 283
translation, 279, 337
schema-based matching, 284–286
schema-level matching, 288
schema-on-read, 293, 493
schema-on-write, 293
Schism, 74, 85
SDD-1, 176
search engine, 539, 542
Search Space, B-15
search space, 360, B-14
Search Strategy, B-17
search strategy, 135, 364, B-15, B-17
searchspace, 131
selection operator, A-7, A-8
selection predicate, A-8
selection selectivity, B-20
semantic data control, 14
semantic data controller, 23
semantic heterogeneity, 286
semantic integrity constraint, 91, 110
semantic integrity control, 91, 110
semantic translation, 299
semantic web, 399, 569, 573, 593
semi-automous system, 18
semijoin, 151
semijoin operator, A-7, A-13
semijoin program, 152
semijoin selectivity, B-22
SEMINT, 290
semistructured data, 549
serial history, C-25
serializability, 183, 185, C-13, C-22, C-24
one-copy, 248
serializable history, C-26
service level agreement, 28
service oriented architecture, 27
Sesame, 578, 593
set difference operator, A-7, A-9
set-oriented constraints, 117, 118, 120
SETI@home, 386
shadow page, C-44
shadowing, C-44
sharding, 36
shared-disk, 348
shared-memory, 346
shared-nothing, 350
ship-whole, 164
shuffle, 444
shuffle partitioning, 468
SL, see snapshot isolation, see snapshot isolation,
see snapshot isolation, see snapshot isolation
similarity flooding, 327
similarity value, 283
simple predicate completeness, 42
minimality, 42
simple virtual partitioning, 377
simplification, 115
simulated annealing, B-2
single location DBMS, 2
single-source shortest path, 273
skip graph, 395
SkipNet, 395
snapshot database, 457
snapshot isolation, 182, 183, 186, 200, 203, 204
strong, 250
Software-as-a-Service, 5
sort merge join, 356
soundex code, 288
source accuracy, 589
source dependency, 590
source freshness, 591
source schema, 283
Spanner, 233, 519
Spark, 499, 516
SPARQL, 72, 539, 575, 579, 582, 585, 592
SPIRAQ, 584
Sparksee, 516
Splice Machine, 518
Splitting, 53
SQL, A-17
SQL++, 509, 523, 524, 535
stable database, C-20
stable log, C-43
stable storage, C-22
star network, D-5
Start system, 559, 593
state logging, C-43
static optimization, 137
static query optimization, B-2
steal/force, C-47
steal/no-steal decision, C-27
stream data, 439
STREAM, 458, 499
StreaQuel, 461, 498
Index

strict history, C-12
strongly connected component query, 475
structural conflict, 285
structural constraint, 110
structural similarity, 289
structure index, 545
structure-based matching, 289
structure-level matching, 284, 285
StruQL, 554, 593
subgraph matching, 473
substitution, B-25
superkey, A-2
superpeer system, 388
superstep, 481
SVP, see simple virtual partitioning
SW-Store, 593
switching, D-6
SWORD, 76, 80, 85
symmetric hash join, 359
synonym, 286
synonyms, 286
System R, C-44
System R*, 190, 194
SystemML, 448, 498
TA, see Threshold Algorithm, 402
Threshold Algorithm
Tableau, 405
tablet, 512
Tapestry, 418
target schema, 281
TCP/IP, D-8, D-9, D-11
TelegraphCQ, 458, 499
Tenzing, 448, 498
termination protocol, 207
non-blocking, 208
non-blocking, 216
text index, 546
think-like-a-vertex, 481
Three Phase Uniform Threshold Algorithm, 403
two-step commit, 223
Threshold Algorithm, 401
Threshold algorithm, 402
tight integration, 130
time travel query, 203
timeout, 206
timestamp, 194, 196, 199, 200, 203
read, 196
write, 198
write order, 186
timestamp ordering, 195, 199
basic, 193
conservative, 198, 200
multiversion, 198
timestamping, 15

TimeStream, 458
Titan, 516
top-down database design, 13
top-k query, 401
total cost optimization, 192
total isolation, 19
total time, B-18, B-19
TPUT, see Three Phase Uniform Threshold Algorithm
transaction, 181
abort, see abort
atomicity, 183
base set, 183
batch, C-14
closed, C-15
closed nested, C-16
compensating, C-17
consistency, 181
consistency
conversation, C-14
distributed, 10
durability, 183
see durability
failure, see transaction failure
flat, C-15
formal definition, C-7
global undo, see global undo
isolation, 183
see isolation
long-life, C-14
manager, 184
nested, C-16
online, C-14
open nested, C-15
partial undo, see partial undo
properties, C-9
read set, 183
read-before-write, C-14
recovery, see transaction recovery
redo, see transaction redo
restricted, C-14
restricted two-step, C-14
short-life, C-14
split, C-17
two-step, C-14
types, C-14
undo, see transaction undo
workflow, see workflow
write set, 183
transaction consistency, C-1
transaction failure, C-38
transaction log, see log
transaction recovery, C-39
transaction redo, C-42
transaction undo, C-42
transformation rule, B-10
Index

transition constraint, 113
transitive closure, A-9
transparency, 2, 7, 20
correspondence, 10
distribution, 9
failure, 10
fragmentation, 9
location, 9
naming, 9
network, 9
replication, 10
transport layer protocol, D-9
tree query, A-15
Tribeca, 460
Trusty, 484
triple, see RDF triple
Tritus, 559
tuple, A-1
variable, A-16
tuple relational calculus, A-16
tuple substitution, B-26
two-phase commit, 10, 208, 239
centralized, 211
distributed, 212
linear, 211
nested, 211
presumed abort, 214
presumed commit, 216
two-phase locking, 187, C-31
centralized, 187
distributed, 189
primary copy, 257
primary site, 187
strict, 190, C-31
type
  conflict, 285
UDF, see user-defined function
UMA, 547
undo/no-redo, C-47
unfolding, 307
unicast network, D-9
uniform memory access, 1747
unilateral abort, 298
union operator, A-9
Uniprot RDF, 573
unique key constraint, 112
UnQL, 592
update anomaly, A-3
user interface handler, 23
user processor, 23
user-defined function, 445
VBI-tree, 395
veracity, 438 see also data quality, 497
vertex-centric asynchronous, 497
vertex-centric BSP, 483
vertex-centric gather-apply-scatter, 489
vertex-centric graph model, 381
Vertica, 36
Vertical Fragmentation, 142
view, 91, 92, 308, 307
definition, 92, 305
management, 91, 92
materialization, 92
materialized, 92
view management, 91
virtual machines, 28
virtual relation, 92
volatile database, C-20
VoltDB, 518
voting-based protocol, 227
W3QL, 554
WAIT-DIE algorithm, C-36
wait-for graph, C-35, C-37
WAL, see write-ahead logging
WAN, see wide area network
WCC, 487, 490
weakly connected component, 475
web
crawling, 543
data fusion, 587
data management, 539
datagraph, 540
querying, 548
search, 542
web data integration
seedata integration
web, 560
web graph, 592
web indexing, 593
web portal, 567
web service, 27
web table, 567
WebLog, 554
WebOQL, 554
WebQA, 559
WebSQL, 554
wide area network, D-3
Wide column store, 510
window, 459
aggregate, 466
count-based, 464
fixed, 460
join, 463
model, 460
partitioned, 460
predicate, 460
query, 459, 461
session, 461
sliding, 460
time-based, 460, 464
user-defined, 461
windowed execution, 458, 461, 463, 464
wireless broadband network, D-6
wireless LAN, see wireless local area network
wireless local area network, D-5
workflow, 236, C-18
human-oriented, C-18
system-oriented, C-18
transactional, C-18
working-set algorithm, C-40
World Wide Web, 4, 16, 539
WOUND-WAIT algorithm, C-36
wrapper, 293, 303
wrapper schema, 305
write lock, C-29
write quorum, 270
write-ahead logging, C-43
WWW, see World Wide Web
X-Stream, 492, 500
xLM, 524
XML, 432, 506, 525, 528, 539, 569, 592
document tree, 571
XML schema graph, 571
XMLSchema, 571
XPath, 573
XQuery, 573
Yago, 573
YAML, 506
zigzag tree, 362
Zookeeper, 496