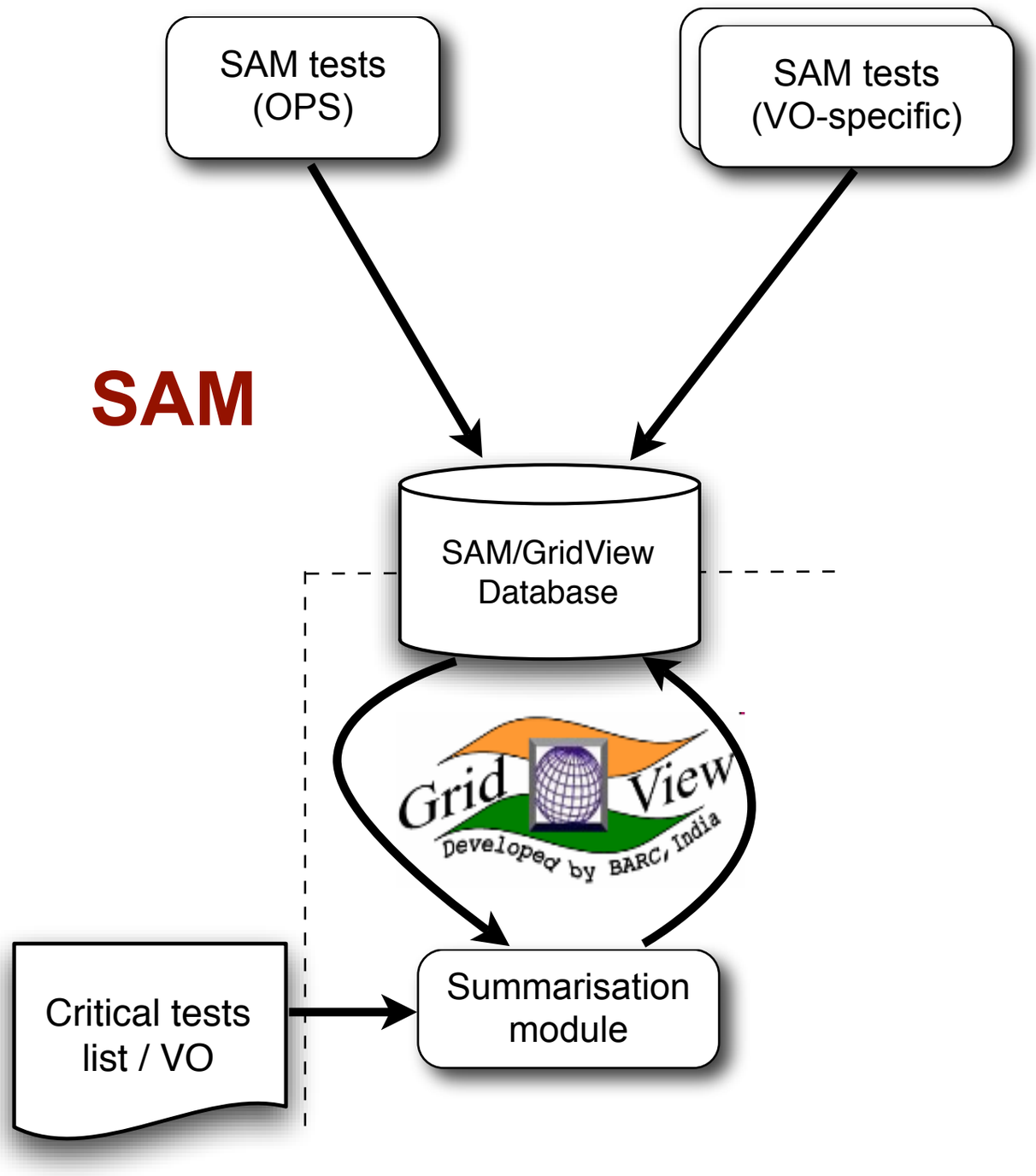
Directions for service availability calculation

Piotr Nyczyk

Grid Deployment Board

CERN, 05 December 2007

Current availability calculation



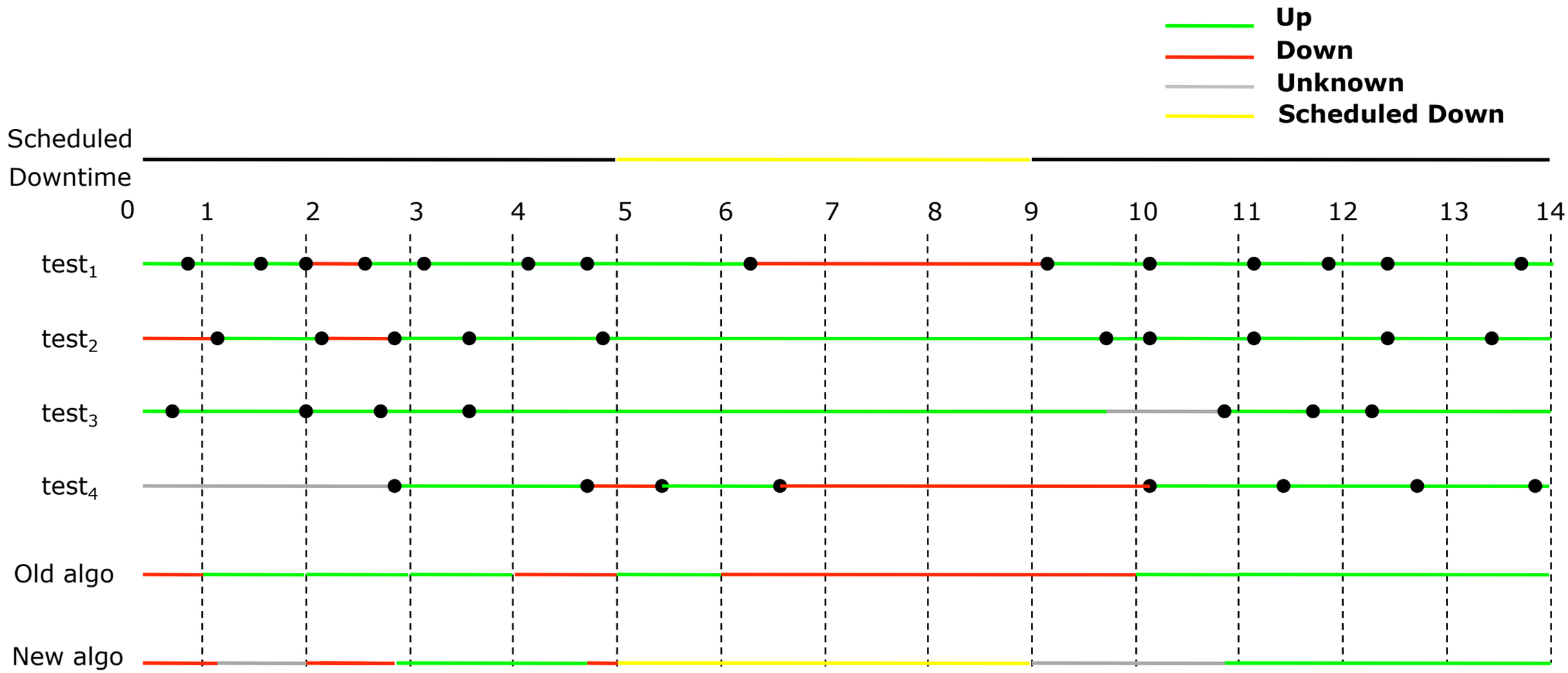
- SAM stores raw test results for all VOs in the DB
- GridView implementation of status and availability calculation algorithm (next slides)
- One list of critical tests per VO
- Efficient (?) calculation - working directly on the DB (SQL statements)
- Continuous time scale for status calculation (no sampling)

Two algorithm implementations

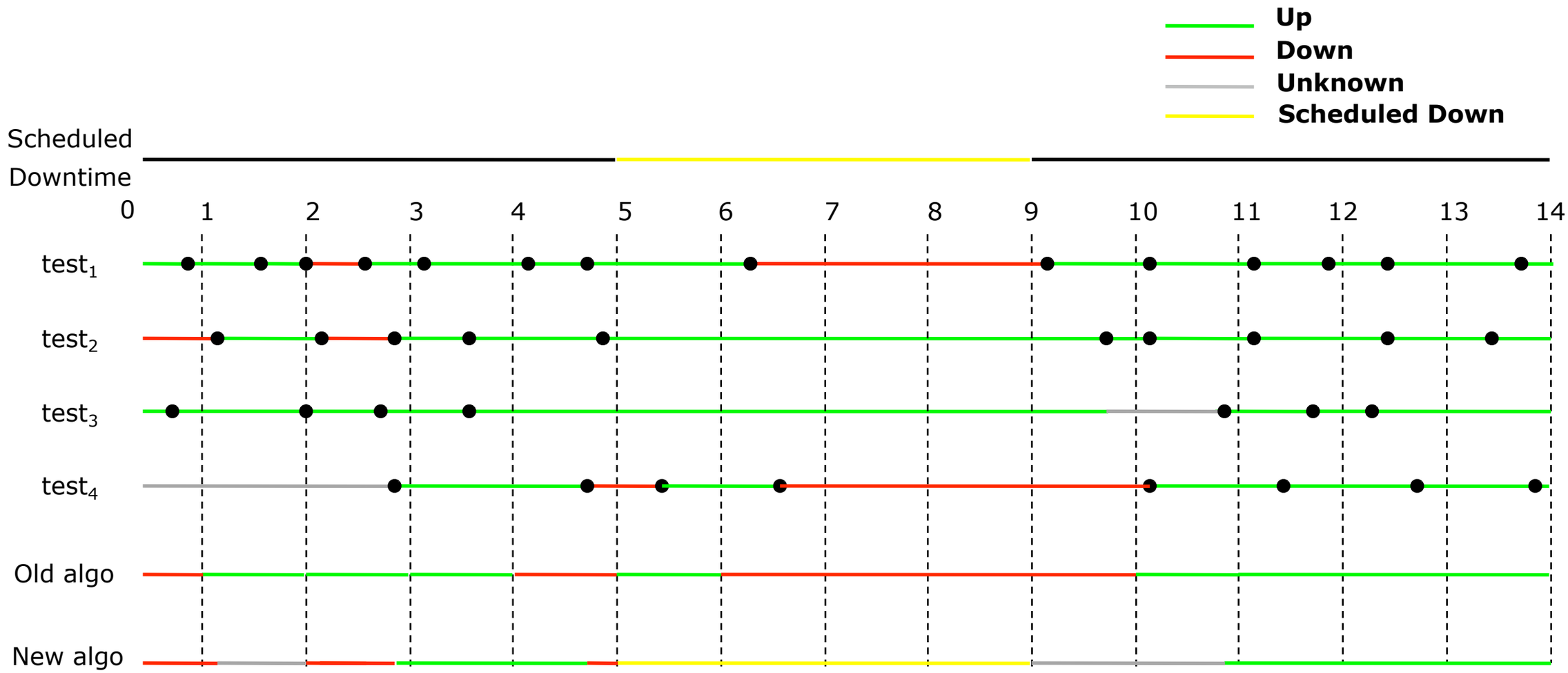
- Old algorithm (not used any more)
  - Computes Service Status on Discrete Time Scale with precision of an hour
  - Test results sampled at the end of each hour
  - Service status is based only on latest results for an hour
  - Availability for an hour is always 0 or 1
- Drawbacks of Discrete Time Scale
  - Test may pass or fail several times in an hour
  - not possible to represent several events in an hour
  - loss of precise information about the exact time of occurrence of the event
- New Algorithm (current)
  - Computes Service Status on Continuous Time Scale
  - Service Status is based on all test results
  - Computes Availability metrics with higher accuracy
  - Conforms to Recommendation 42 of EGEE-II Review Report about introducing measures of robustness and reliability
  - Computes reliability metrics as approved by LCG MB, 13 Feb 2007

Major Differences

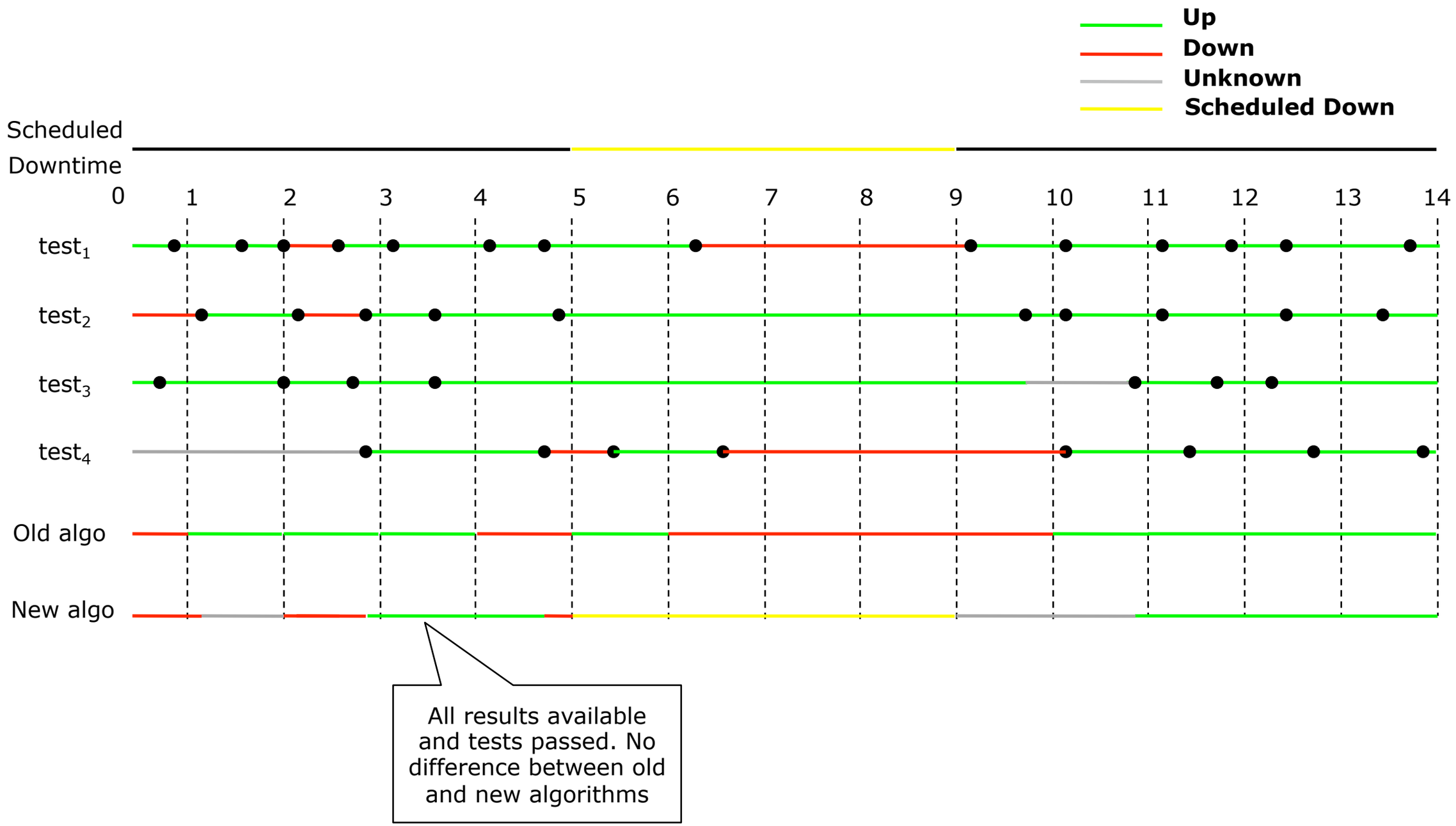
- Major differences between old and new algorithm
  - Service Status computation on Continuous time scale
  - Consideration of Scheduled Downtime (SD)
    - Service may pass tests even when SD
    - Leads to Inaccurate Reliability value
    - New algorithm ignores test results and marks status as SD
  - Validity of Test Results
    - 24 Hours for all tests in old case
    - Defined by VO separately for each test in New method
    - Invalidate earlier results after scheduled interruption
  - Handling of UNKNOWN status


Up
Down
Unknown
Scheduled Down
Scheduled
Downtime
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
test1
test2
test3
test4
Old algo
New algo

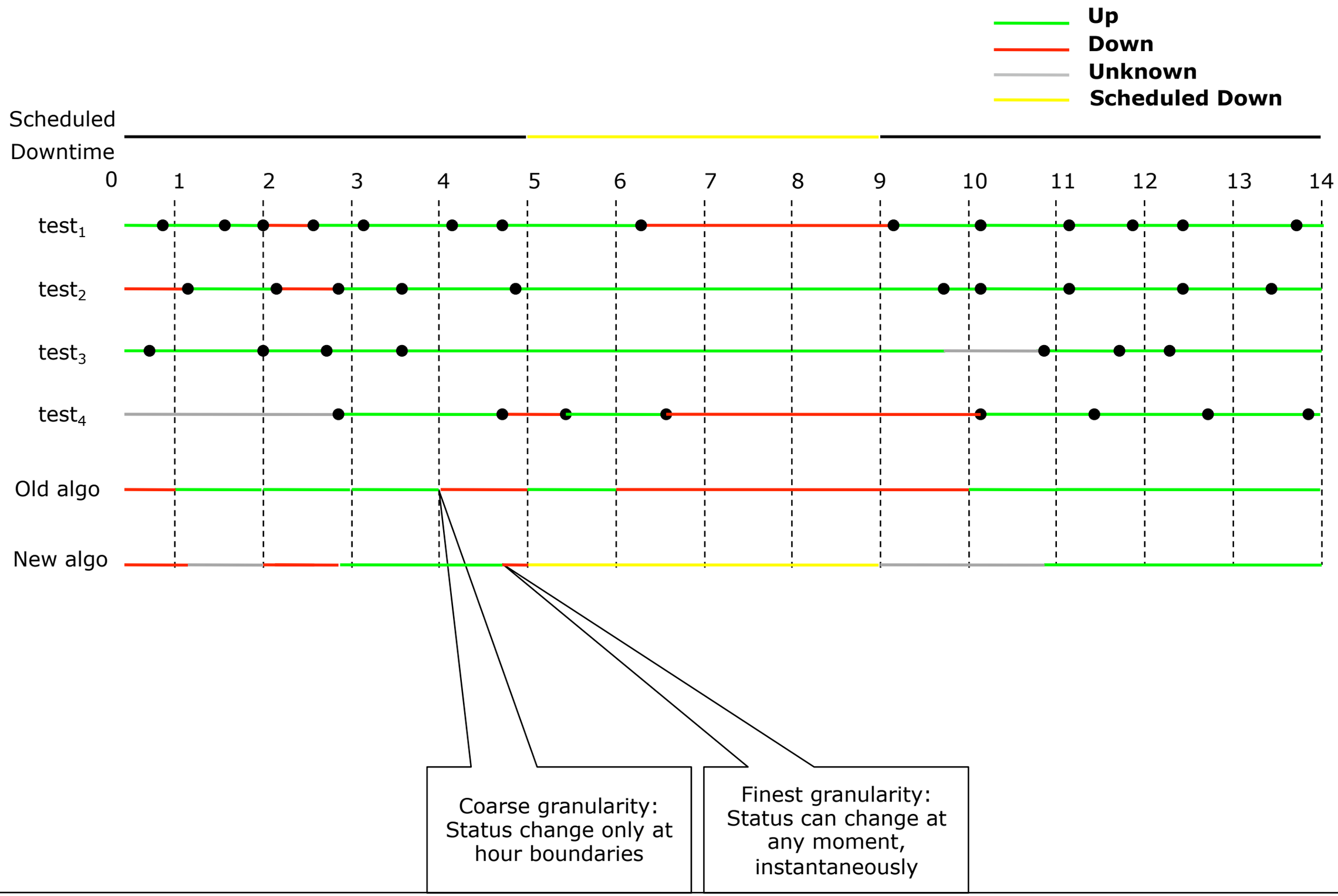
Computation of service instance status : Difference between old (current) and new algorithm



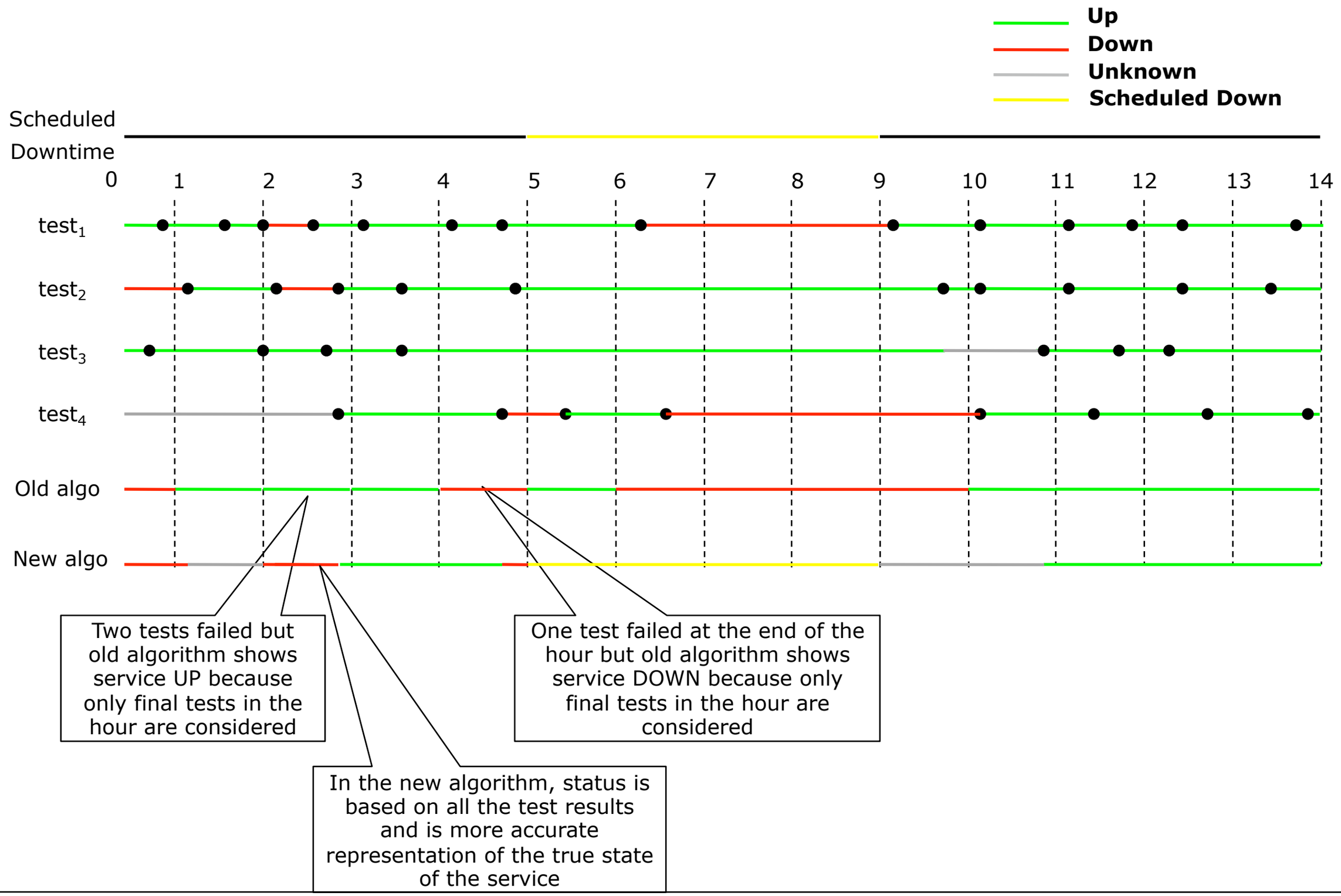
Computation of service instance status : Difference between old (current) and new algorithm



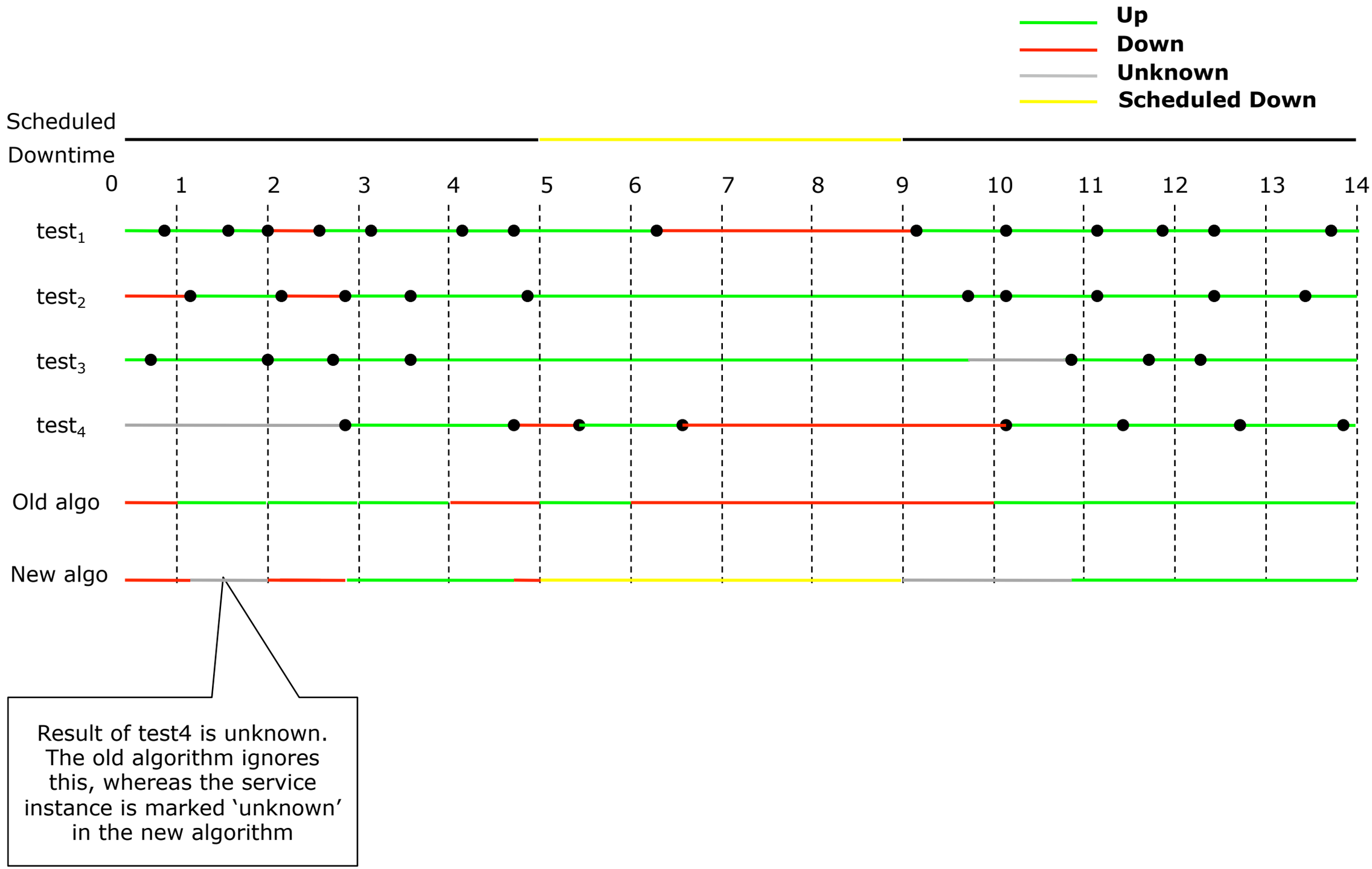
Computation of service instance status : Difference between old (current) and new algorithm



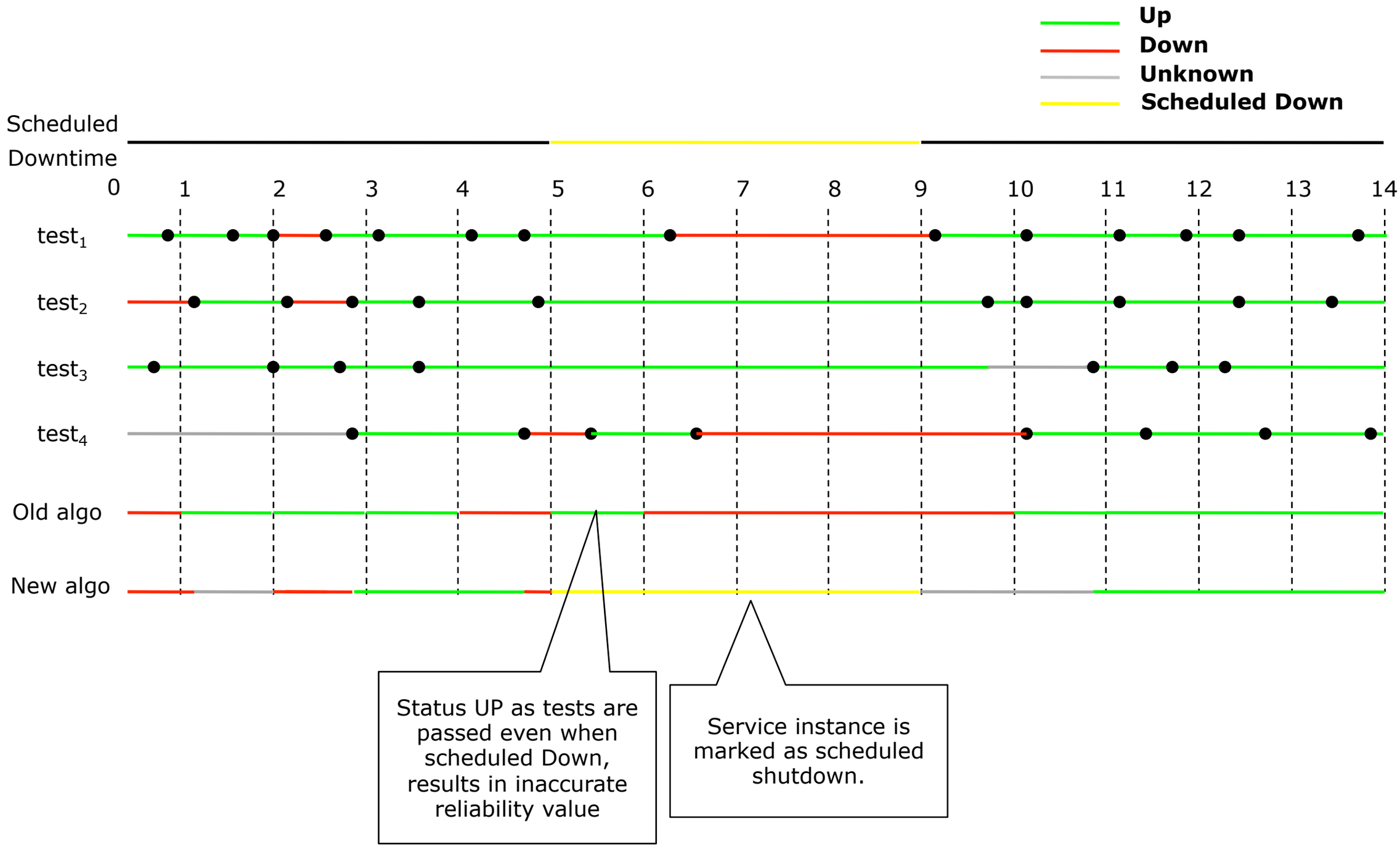
Computation of service instance status : Difference between old (current) and new algorithm



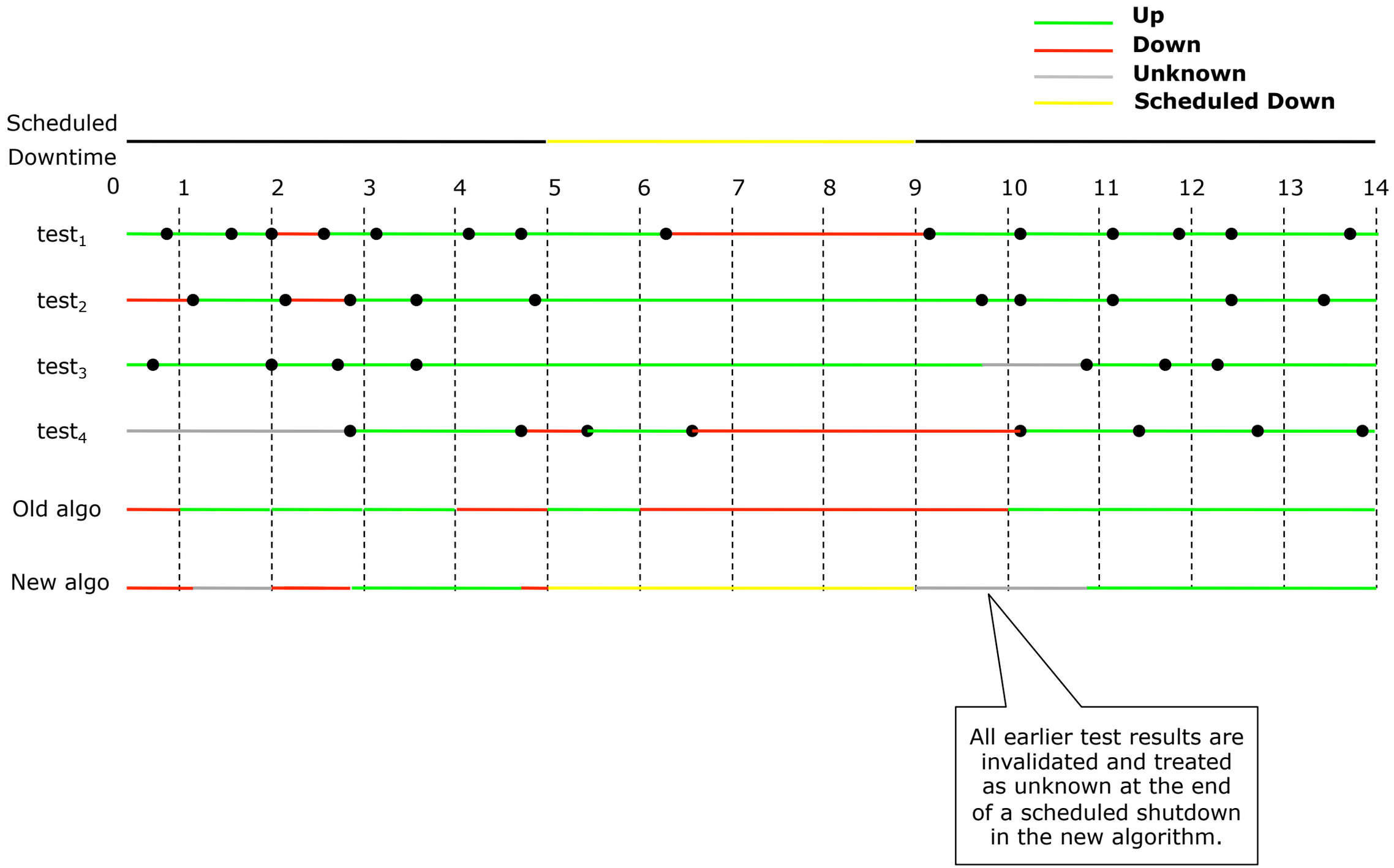
Computation of service instance status : Difference between old (current) and new algorithm



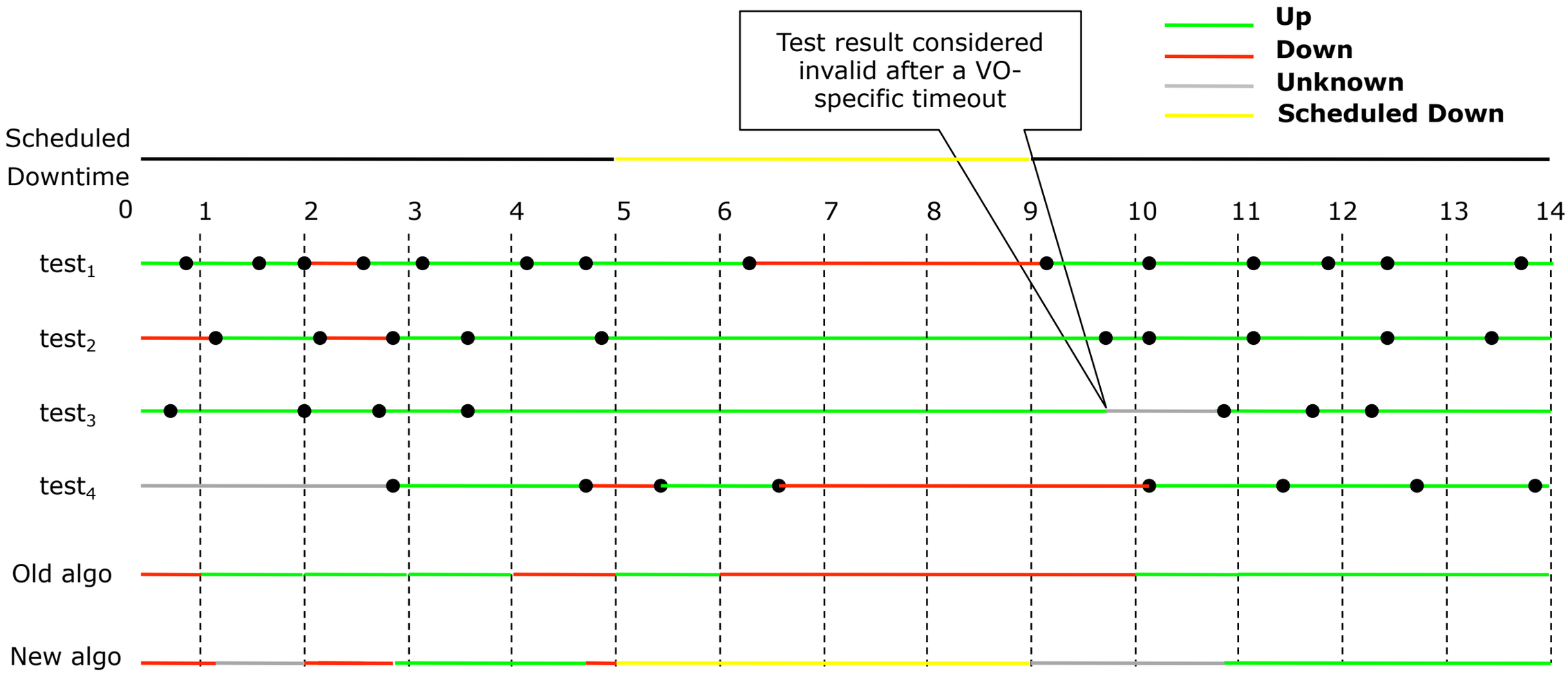
Computation of service instance status : Difference between old (current) and new algorithm



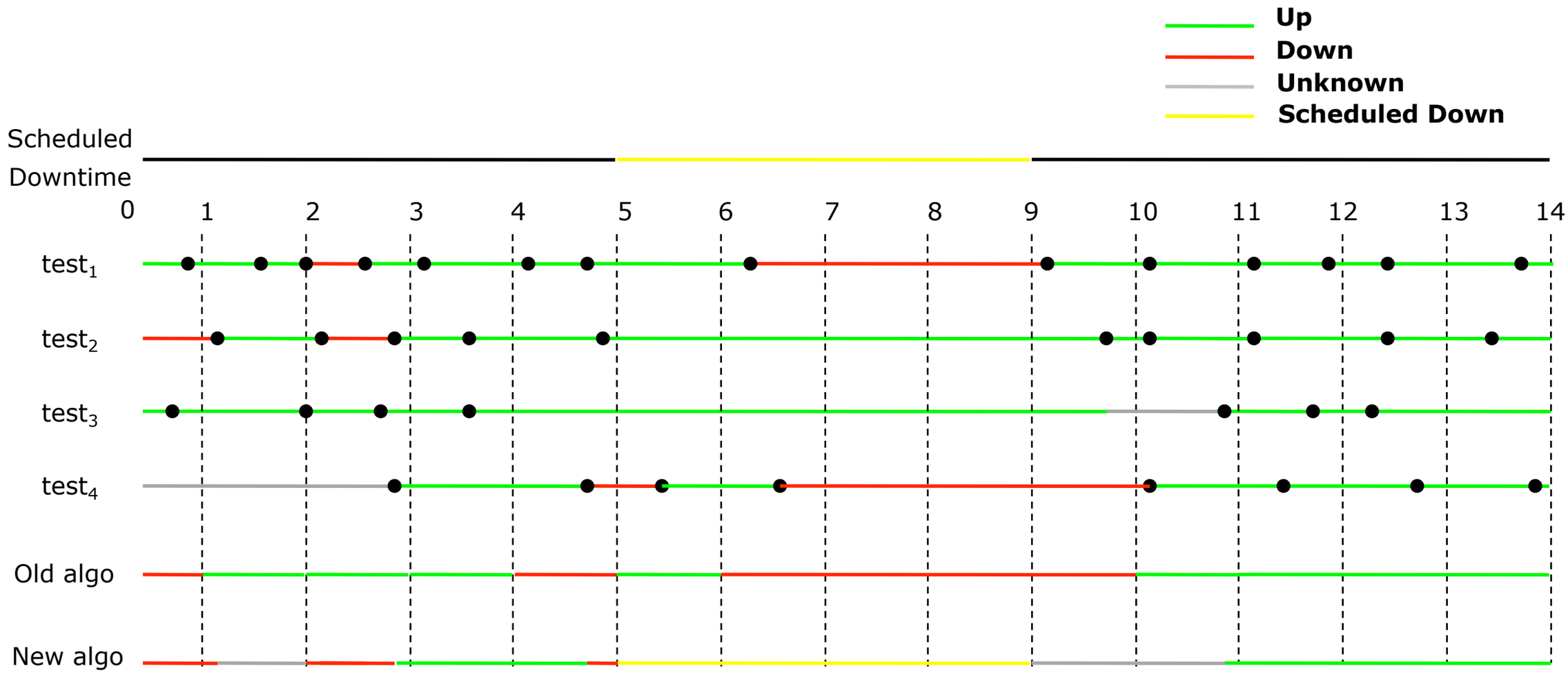
Computation of service instance status : Difference between old (current) and new algorithm



Computation of service instance status : Difference between old (current) and new algorithm



Computation of service instance status : Difference between old (current) and new algorithm



Service & Site Service Status Calculation

(new algorithm)

consider only *critical* tests for a vo

Test Results

test status per (test, si, vo)

aggregate ***test status***

Service Instance Status

per (si, vo)

aggregate ***service instance status*** for site services

ServiceStatus

per (site, service, vo)

aggregate ***site service status***

SiteStatus

per (site, vo)

ANDing

Service marked as scheduled down (sd) → **sd**

all *test statuses* are **ok** → **up**

at least one *test status* is **down(failed)** → **down**

No test status **down** and at least one *test status* is **unknown** → **unknown**

ANDing

all *service statuses* **up** → **up**

at least one *service status* **down** → **down**

no service **down** and at least one is **sd** → **sd**

no service **down** or **sd** and at least one is **unknown** → **unknown**

ORing

At least one *service instance status* **up** → **up**

No instance **up** and at least one is **sd** → **sd**

No instance **up** or **sd** and at least one instance is **down** → **down**

All instances are **unknown** → **unknown**

Service = *a service type (e.g. CE, SE, sBDII, ...)*

Serviceinstance (si) = (*service*, *node*) combination

Limitations

- Only one list of critical tests per VO used for everything:
  - availability metric (reports)
  - operational alarms
  - BDII exclusion using FCR
- Consequence: only one target metric per VO - simply “availability” (plus “reliability”)
- Completely uniform:
  - all sites treated in the same way (Tier 0,1,2)

Additional requirements

- Different criticality targets in several dimensions
  - metric usage: availability report, alarms, BDII exclusion
  - application domain or functionality: simulation, reconstruction, analysis, ... (VO dependent)
- Service and site categorisation: tier 0, 1, 2, ... (depending on computational model)
- More complex status calculation logic:
  - OR expressions on tests aggregation (not only simple AND of critical tests)
  - additional factors (not known at design time)
- Distributed sites or tier centres as metric targets

Current workarounds

- "Intelligent tests" - varying results on site role
  - masking failures of Tier-1 related tests on Tier-2 sites
  - additional knowledge and logic needed by the test (where from?)
  - **Disadvantages:** complex tests, mixing tests with results analysis
- Externally calculated availability
  - get raw test results using SAM API (last hour/day)
  - calculate customised metrics
  - store in own DB (experiments dashboards)
  - **Disadvantages:** additional data transfers, storage redundancy (synchronisation?), no feedback to SAM

Future - preferred solution

- Messaging system (MSG) as monitoring data exchange bus
  - all tests published to a common messaging system as metrics (SAM and other monitoring tools)
  - everyone can subscribe - multicast approach to distribute raw results to many repositories
  - distributed and decentralised calculation of *derived* metrics by customised summarisation components
  - derived metrics re-published to the messaging system
  - SAM/FCR can subscribe to various derived metrics for different purposes:
    - alarm metric
    - availability metric (report)
    - BDII exclusion triggering metric
- Advantages: best flexibility and scalability, possible decentralisation of SAM/GridView
- Challanges: need for robust messaging (additional effort), dealing with message latencies (on-line summarisation, delay loop?)

Future - other options

- Refactored SAM/GridView summarisation algorithm
  - Stay with GridView summarisation component
  - brake availability metric into VO-dependent and named metrics
  - provide a flexible way (language) to define metric calculation rules
  - Advantages: uniform software, standardisation
  - Disadvantages: flexible enough?, centralisation, scalability?
- Current approach with some improvements
  - incremental updates (new results in last hour)
  - metric results published back to SAM (how?)
  - Advantages: least effort, in future migration to messaging system
  - Disadvantages: significant latencies - can be considered as an intermediate solution (!)

General observations

- Breakdown of “availability metric” into several specific metrics is needed anyway
- Robust and scalable messaging layer allowing multicast publishing is unavoidable in longer term
- General understanding of which metrics are really needed and what they represent is crucial (not to get lost in plenitude of meaningless metrics)
- Decentralisation and distribution of current SAM/ GridView system is probably a good move

Questions

- What are exactly the requirements? (we need to build a list)
- Do we agree on common formats?
  - message format
  - monitoring data exchange / queries
- Will all new availability/reliability metrics become just normal metrics? (as defined by the WLCG Monitoring WG)
- Who will do this?