TERRAIN

Testing and Evaluation of Routing Robustness in Assurable Inter-domain Networking

What Is TERRAIN

- A local database framework containing
  - Data of Regional Internet Registries and Internet Routing Registries (RIR/IRR)
    - Keeps track of changes over time
    - Normalizes attributes to allow cross referencing
  - BGP trace data from RIPE NCC and RouteViews collectors

- A set of tools to facilitate the development of algorithms
  - IP prefix normalization
  - AS number normalization
  - Global namespace
  - Prefix tree that allows non CIDR ranges

- A set of algorithms to "identify" the quality of data
  - Completeness and robustness of data
  - Syntactical Correctness of data
 - Normalization and standardization of data

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TERRAIN Scope and Focus

- Keep local copies of regional internet registries (RIR) and internet routing registries (IRR).

- Facilitate the comparison of different algorithms against same set of data.
  - Allows detailed analysis on how algorithms perform

- Provides capability of running algorithms against different data "qualities".
  - Registry data from 2006, 2007, 2008, 2009
  - This allows impact studies in regards to data "improvements".

- Normalization between BGP trace data and registries.

- Allow the generation of Synthetic trace data that can be used as Standard Reference Materials (SRM)s.

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How the System Works

- Continuously extracts Internet's registry and BGP monitoring data.

- Unified data model for storing disparate data sources.
  - Designed for 5+ Terabytes.

- Research platform for the design and analysis of robustness mechanisms.

- Information quality measurements of registry data.

- Allows automated report generation of periodically produced analysis results.
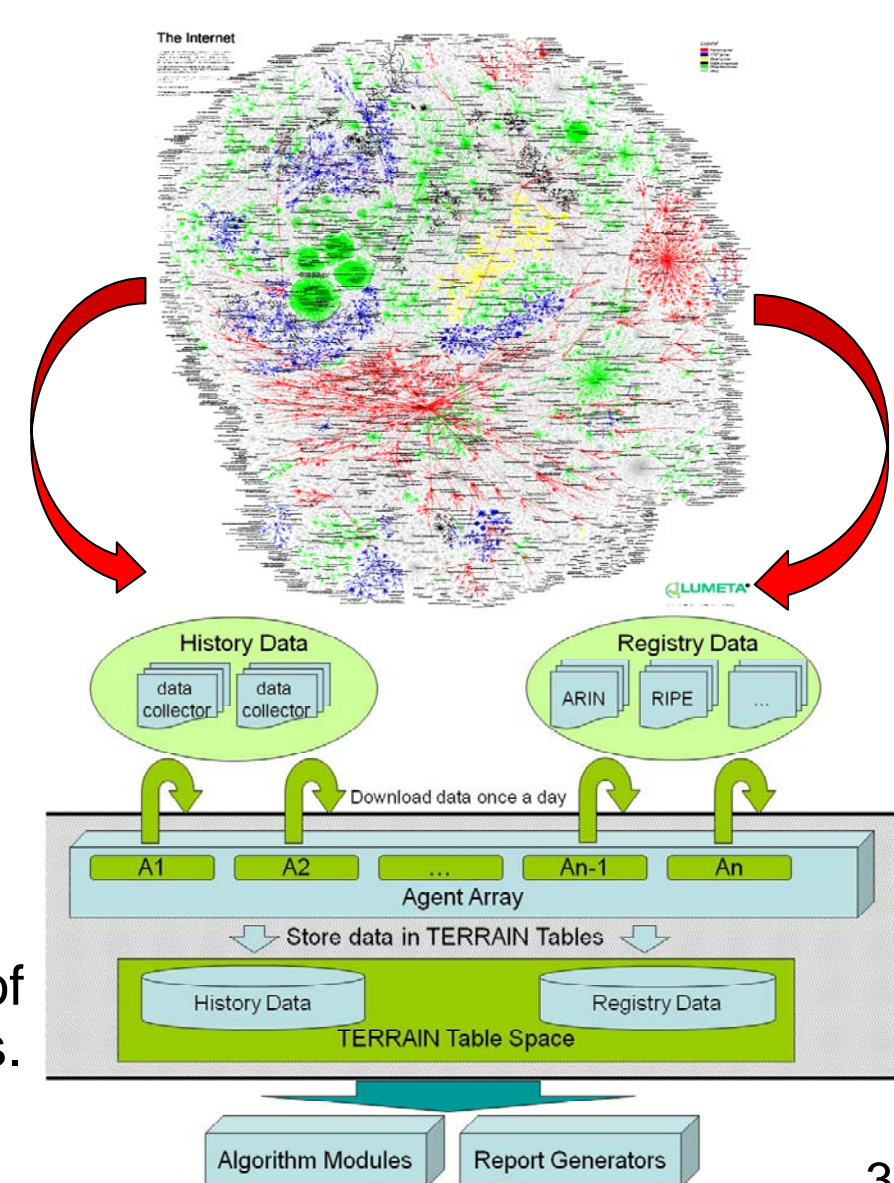
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Agent Layer Design
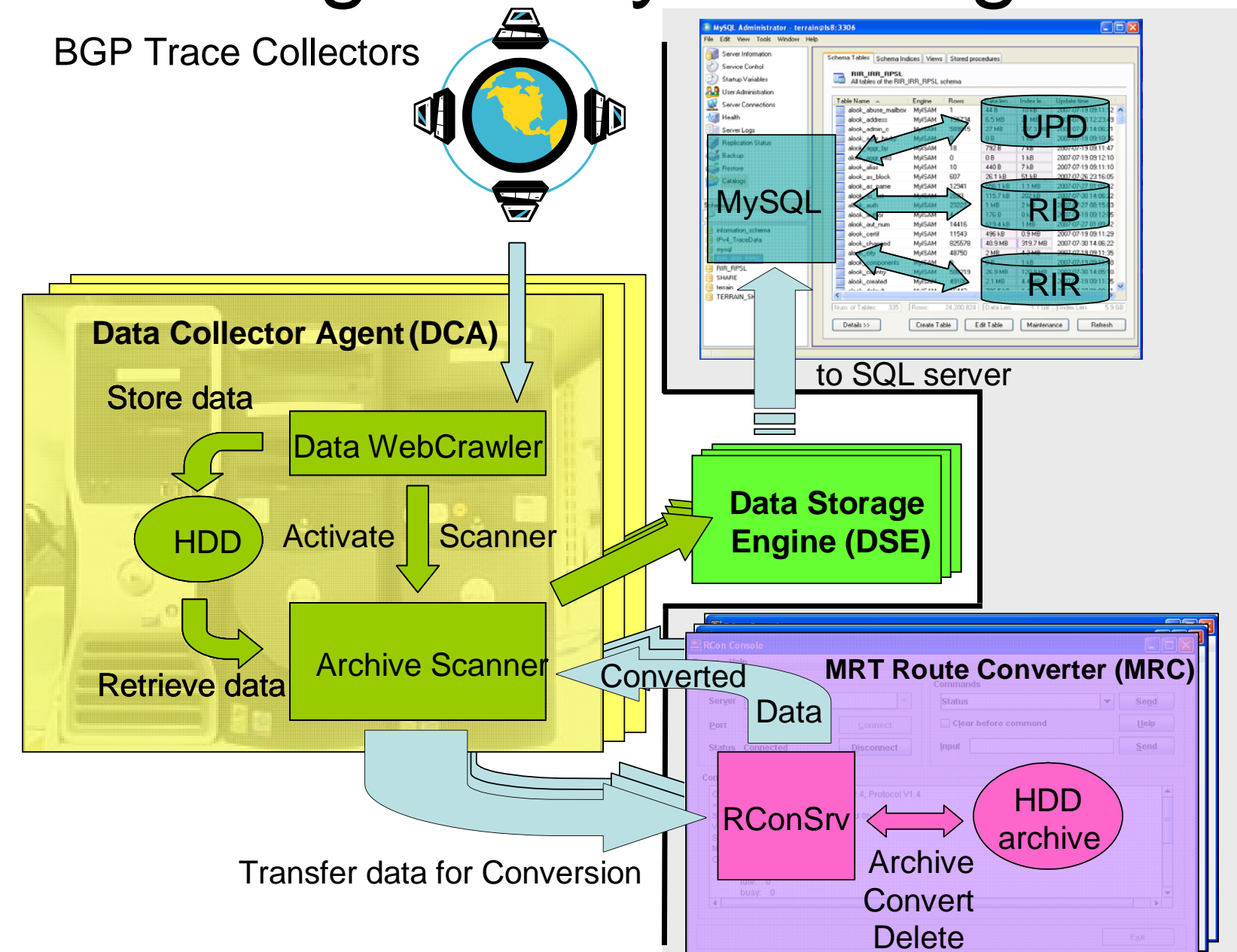
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The Temporal Design Aspect

- Keep track of changes in regards to data increase, decrease, and modification over time.
- Allow the introduction of new attributes to classes over time.
  - Adoptable to future structure changes.

A NetHandle Object created in 2006

> NetHandle: NET-192-168-0-0-1
> NetRange: 129.6.0.0 – 129.6.255.255
> Comment: NIST nethandle
> …

The NetHandle Object in TERRAIN

NetHandle	NetRange	Comment	OriginAS	Created	LastSeen
NET-192-6-0-0-1	129.6.0.0/16			2006	2006
NET-192-6-0-0-1		NIST …		2006	2006

NetHandle Object change in 2009

> NetHandle: NET-129-6-0-0-1
> NetRange: 129.6.0.0 – 129.6.255.255
> **OriginAS: 49**
> Comment: NIST nethandle
> …

NetHandle Object changed in TERRAIN

NetHandle	NetRange	Comment	OriginAS	Created	LastSeen
NET-192-6-0-0-1	129.6.0.0/16			2006	2009
NET-192-6-0-0-1		NIST …		2006	2009
NET-192-6-0-0-1			49	2009	2009

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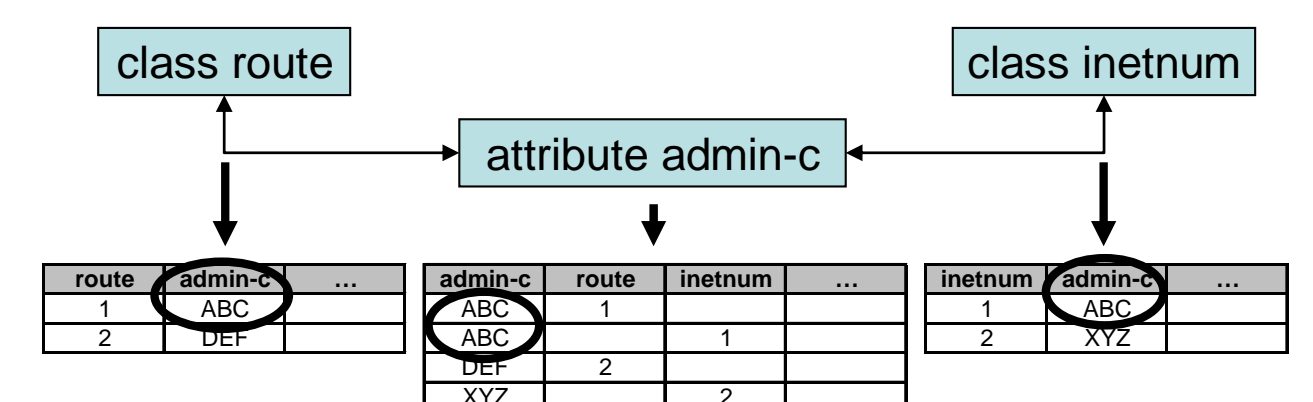## Database Design Graph

Registry Classes

RPSL classes in TERRAIN

- as-block
- as-set
- aut-num
- domain
- filter-set
- inet6num
- inetnum
- inet-rtr
- key-cert
- limerick
- members
- mntner
- organisation
- peering-set
- person
- poem
- poetic-form
- rmute

- role
- route
- route6
- route-set
- rtr-set

SWIP classes in TERRAIN

- NetHandle
- V6NetHandle
- POCHandle
- OrigID
- ASHandle

Database Classes

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