

- STORET/WQX Conference Call – April 25th, 2013 12:00- 1:00 P.M. Eastern Time
- **Introduction (Charles Kovatch)**
- The minutes from all previous conference calls are available over the web:  
<http://www.epa.gov/storet/confcalls.html>
- The next scheduled call will be May 2013. The exact date will be emailed via the list server when the call gets closer.
  - Please email [STORET@epa.gov](mailto:STORET@epa.gov) and let EPA know you attended the call so that meeting rosters may be kept.
- If you have a special topic you would like to lead for an upcoming call, please email [Kovatch.Charles@epamail.epa.gov](mailto:Kovatch.Charles@epamail.epa.gov)
- - EPA would like to hear comments you have on the quality of these conference calls. Please send them to [STORET@epa.gov](mailto:STORET@epa.gov)
- - Please subscribe to the STORET automated server for announcements regarding conference calls:  
<http://www.epa.gov/storet/listserv.html>
- **Presentation: Virtual Note: A multi-tenant implementation for cloud computing (Nathan Wilkes, EPA Office of Environmental Information)**

# Virtual Node

A multi-tenant implementation  
for cloud computing

Presented on STORET User Call 05/30/13

Nathan Wilkes

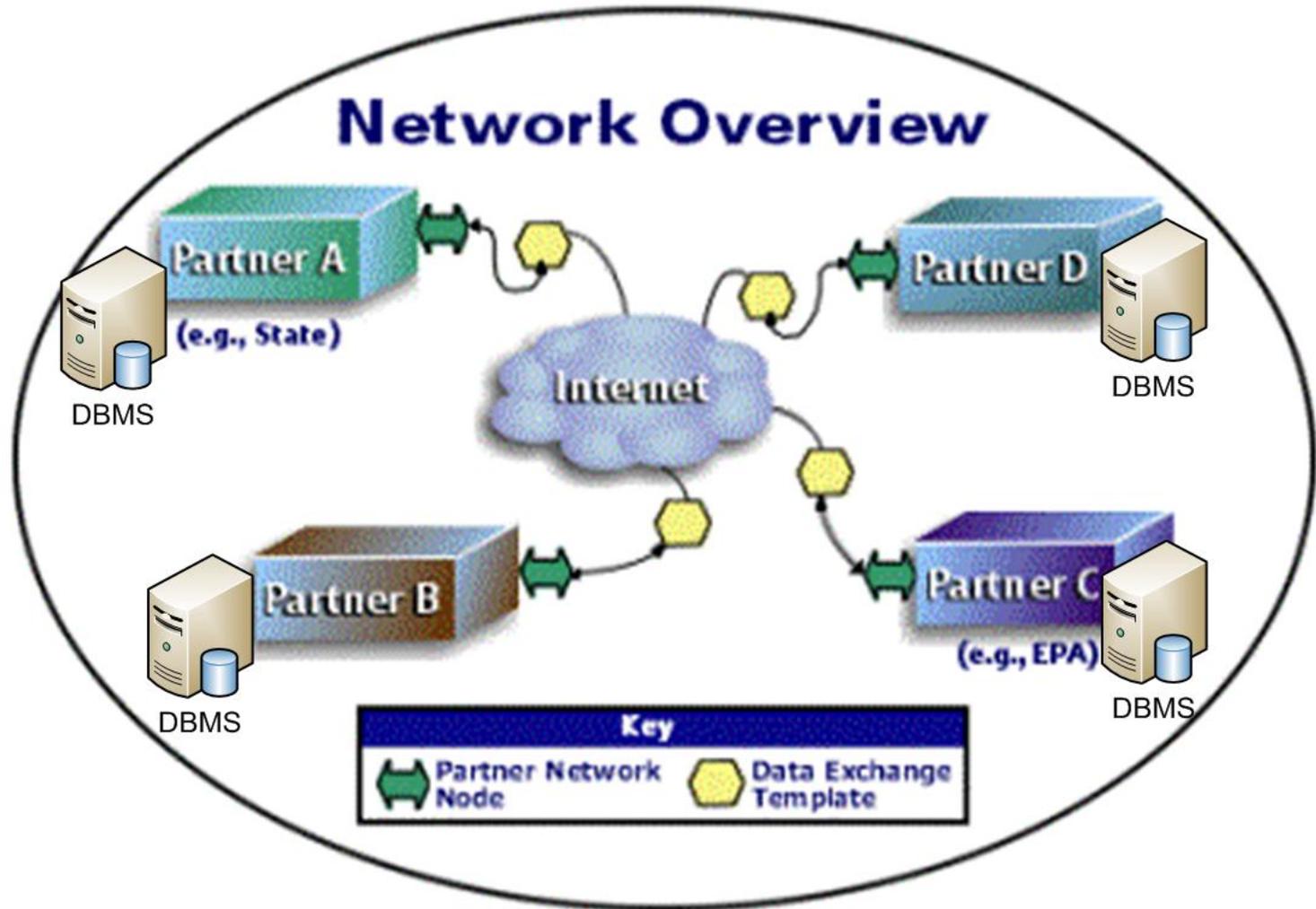
EPA Office of Environmental Information

[Wilkes.nathan@epa.gov](mailto:Wilkes.nathan@epa.gov)

# Topics

- What is a Virtual Node?
- Virtual Node Characteristics
- Virtual Node Architecture
- Virtual Node Management Services
- Conclusion

# Current EN Architecture



# EN Characteristics

- Nodes are geographically distributed, web services are used for information exchanges.
- Data sources (database servers) are typically in the same local environment or reachable through security arrangements.
- Nodes are based on various platforms and running on many operating systems.

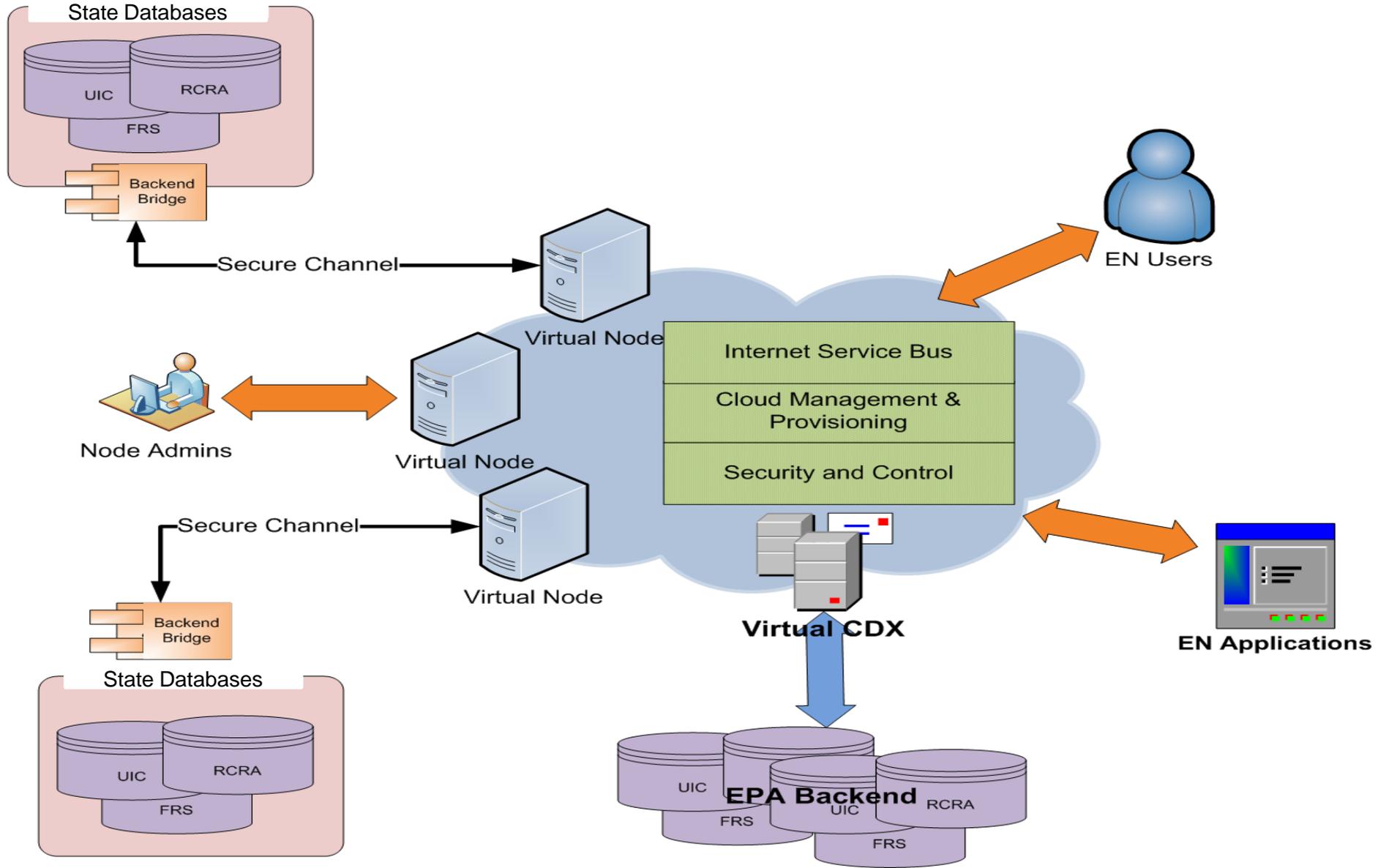
# Major Challenges

- **Interoperability:** There are many potential interop issues due to vendor bugs, variations in implementation and platforms. Debugging is resource intensive.
- **Operation:** Keeping all 50+ nodes running is expensive. Most of the nodes do not have advanced load balancing and failover capability.
- **Maintenance:** Node updates and patching are very costly and difficult - Requires each node admin's attention. No remote administration.
- **Deployment:** Deploying new software to all nodes is very challenging. Requires firewall changes.

# EN In the Cloud

- Nodes could be moved into a centrally managed cloud environment, with scalability and reliability features.
- The number of node implementations could be decreased.
- Nodes could be rapidly deployed into VMs in minutes
- Nodes could be monitored and maintained by fewer administrators.
- Costs (develop, deploy, operate) could be drastically reduced.
- Fewer firewall issues for state partners
- Nodes are guaranteed to be up and running with an Service Level Agreement.
- States have control and significantly decreased support burden

# EN Cloud Architecture



# Key Points in EN Cloud

- Nodes are moved to the cloud, not the databases. Nodes connect to databases through a secure backend bridge (detail to follows).
- A node admin still has control of their node, and control of how it accesses the their databases.
- Users are going to access services in the EN cloud, not directly in the node.
- Node to node, and Node to CDX communications are completely secured within the same network.

# What is Virtual Node

- Virtual node is a node implementation that support cloud multi-tenant model.
- A Virtual Node implementation (physical) can be used to host any number of node instances.
- All node instances share the same software implementation but logically isolated through security walls (Ownership, custody and Policies).

# Virtual Node Requirements

- **Service Provisioning:** A virtual node implementation must be able to create, maintain and execute service requests belonging to different nodes.
- **Security:** A virtual node must perform security authorization using dynamic node identifier associated with a request, so that proper security policy will be applied by NAAS.
- **Transaction Management:** A virtual node implementation must manage and maintain transactions in a single transaction repository. It must be able to provide transaction information for multiple nodes.
- **Communication:** A virtual node implementation must support customized email communication messages.

# Virtual Node Independence

- Virtual node identity – Endpoint. Each node has its own URL but shares the same domain name.
- Virtual node transactions and transaction management
- Virtual node service definitions, dataflow settings and scheduled task configurations.
- Virtual node security control and access control policies.

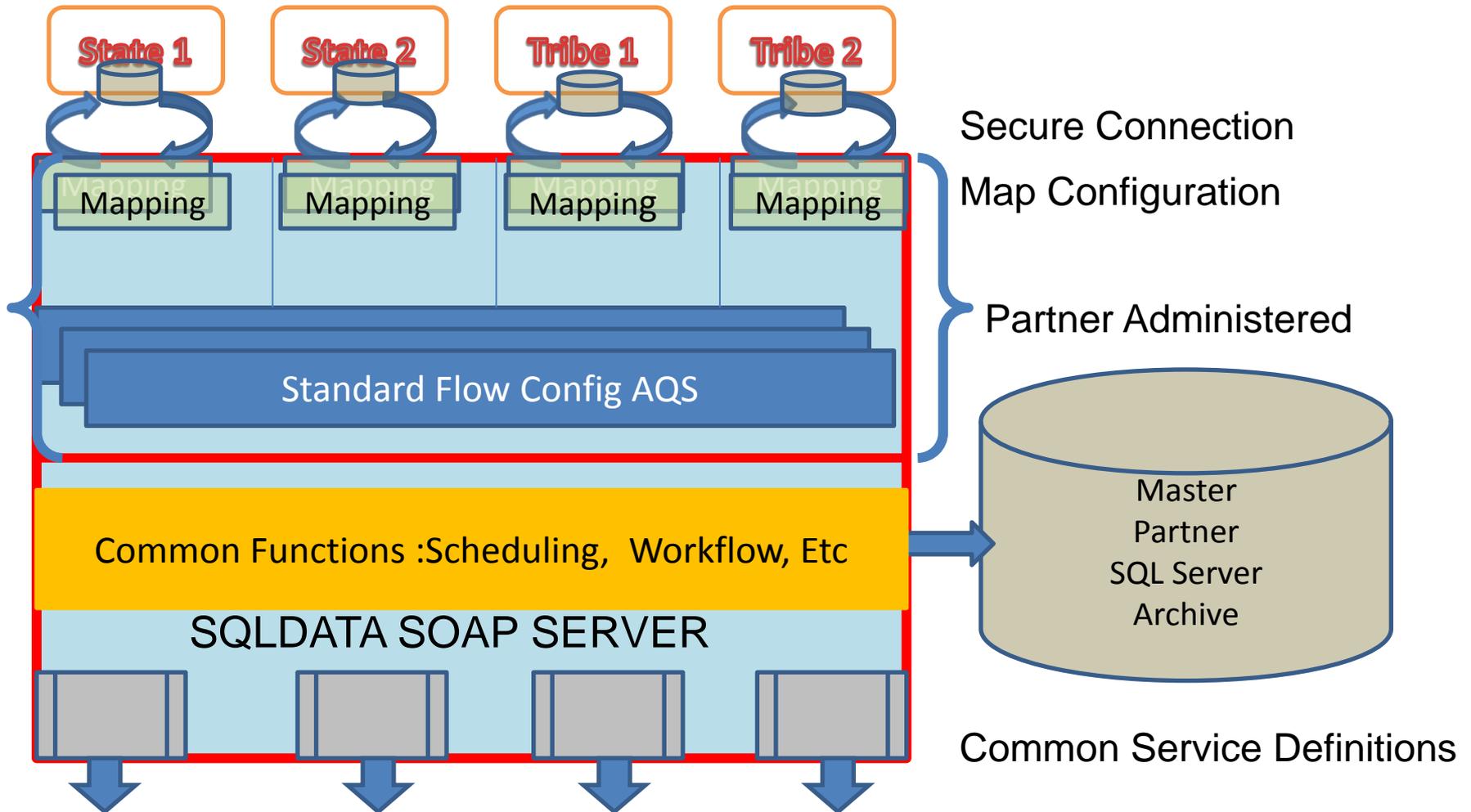
It looks like a node, functions like a node and manages like a node, but it doesn't have the complexity of deploying, operating and maintaining a traditional node.

# Major Advantages

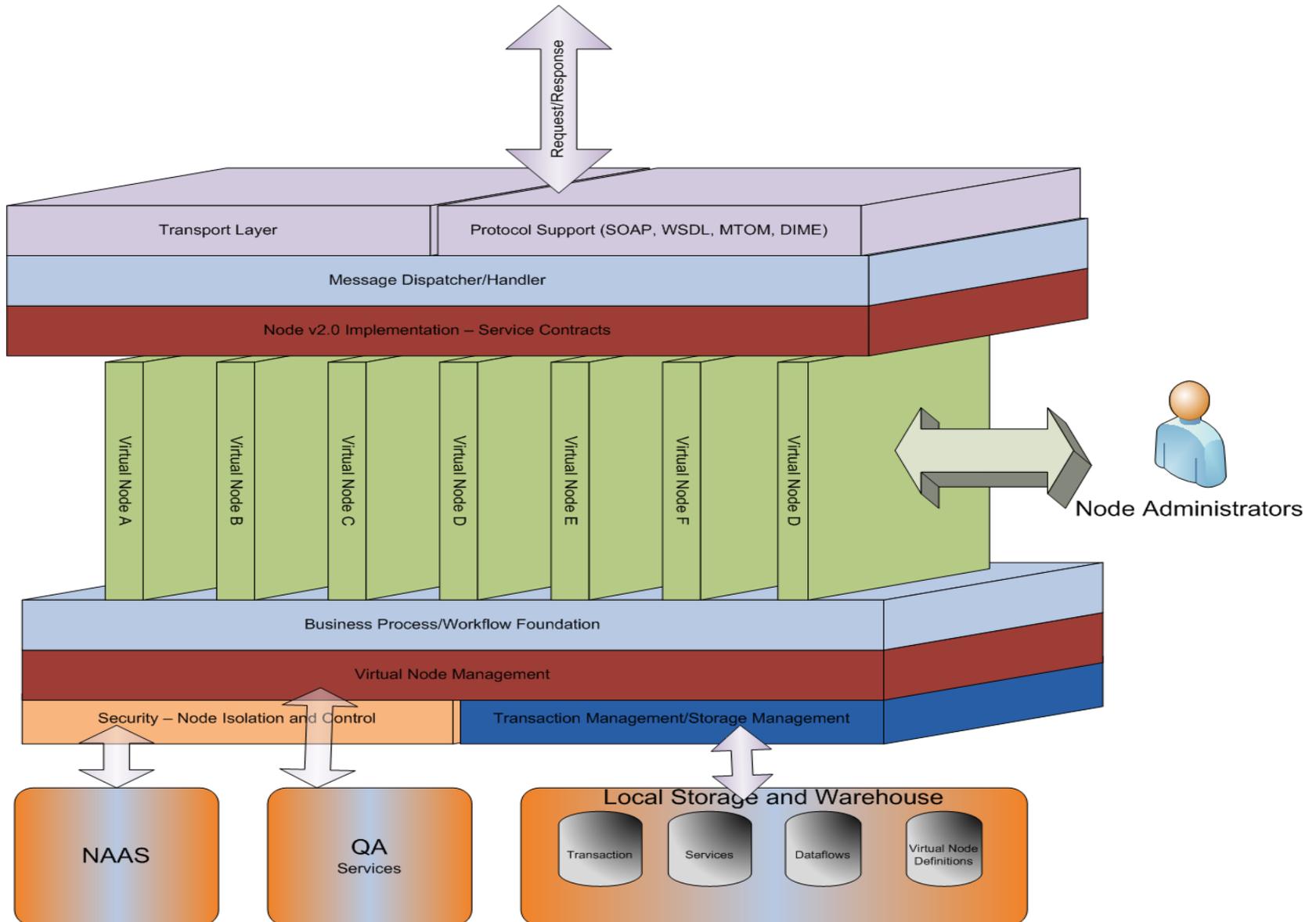
- Low Cost: costs should be significantly lower with a virtual node comparing with traditional node.
- Highly Agile: A node can be created with a button click and it is up and running immediately.
- Enhanced Manageability: With virtual node management services, all nodes can be centrally managed, controlled and serviced.
- Common Architecture: Any new features will be shared by all nodes. Workflows are available to all nodes. A virtual node 'inherits' all services from the 'super-node' or base-node.

# A Variant Cloud Multi-Tenant Model

## Chris Clark's Original Design



# Virtual Node Architecture



# Virtual Node Management Services

- **Node Management:** CreateNode, UpdateNode, DeleteNode and GetNodeList. A node is created by helpdesk, but managed by owners.
- **Service Management:** CreateService, UpdateService, DeleteService and GetServiceList – mainly used by node admins. Services are published to ENDS through node GetServices.
- **Dataflow Management:** CreateDataflow, UpdateDataflow, DeleteDataflow and GetDataflowList.
- **Task Management:** CreateTask, UpdateTask, DeleteTask and GetTaskList – Used by node admins to set up scheduled tasks. Tasks are tied to service definitions.

# Current Development

- Node Data Sources: Virtual node secure data source support is in the design and development stage. This allows a virtual node private data connection definitions in a multi-tenant environment.
- Service Publishing: Virtual node provides GetServices for service pulling from ENDiscoveryService, we are investigate automatic pushing from virtual node to ends based on scheduled tasks.
- Data Publishing: Sample database has been created and it can be used for demonstrating dynamic data publishing functionality.

# Conclusions

- Virtual Node is an implementation of node that support multi-tenant cloud deployment model.
- Virtual Node can drastically reduce complexity and cost of operating nodes in the cloud environment.
- Virtual Node creates a unified node model/interface for future EN architecture.

## **Participants on the call (based on who emailed [STORET@epa.gov](mailto:STORET@epa.gov))**

- James Christman           Hunton and Williams LLP
- James Hudson             Wisconsin DNR
- Diane Stevenson          Cherokee Nation Environmental Programs
- Michael J Whitman         West Virginia Department of Environmental Protection
- Dean Tucker               National Park Service Water Resources Division
- Paul R. Andrews          RTI International
- Michael Basmajian        Georgia EPDDNR
- Susanne K Meidel         Maine Department of Environmental Protection
- Lowell M. Carty           Arizona Department of Environmental Quality
- Molly Pulket               Pennsylvania Department of Environmental Protection
- Rick Langel                Iowa Department of Natural Resources
- Jolene McQuilan          Montana Department of Environmental Quality
- Deb Soule                  New Hampshire Department of Environmental Services
- Bryan Rabon                South Carolina Department of Health and Environmental Control
- Tom Dellaire              Massachusetts Department of Environmental Protection
- Kayren Pittman            Alabama Department of Environmental Management
- Lemonteh Horne          Florida Department of Environmental Protection
- John Beebe                 National Council for Air and Stream Improvement
- Shawn Henderson         Region 7 EPA
- Daniel Reid                Region 6 EPA
- Ben Cole                   Maryland Department of Natural Resources
- Tracie Merrill             Seldovia Village Tribe
- Caitlyn Nichols            NEIWPPC
- Bruce Tuttle               Idaho Department of Water Resources
- Bill Richardson          EPA region 3
- Ben Cole                   Maryland Department Of Natural Resources
- Kathy Knowles             Delaware Department of Natural Resources