The Standards Based Integration Company

Systems Integration Specialists Company, Inc.

Applying the Generic Interface Definition (GID) in a Web Services Environment

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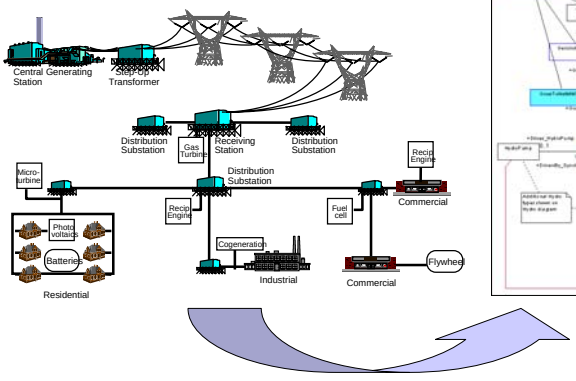
Topics To Be Discussed:

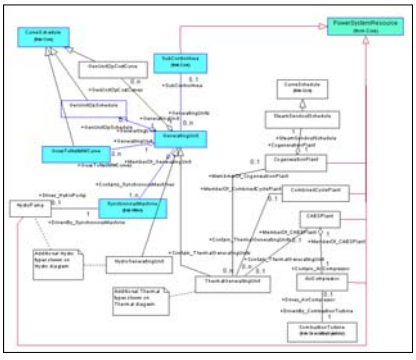
- Utility Industry Standards
  - The Common Information Model (CIM)
  - The Generic Interface Definition (GID)
- Overview of Web Services
- Service Oriented Architecture (SOA) and the Enterprise Service Bus (ESB)
- The GID as Web Services

Common Information Model
CIM

Generic Interface Definition
GID

Common Information Model (CIM) is an object-oriented information model of the power system

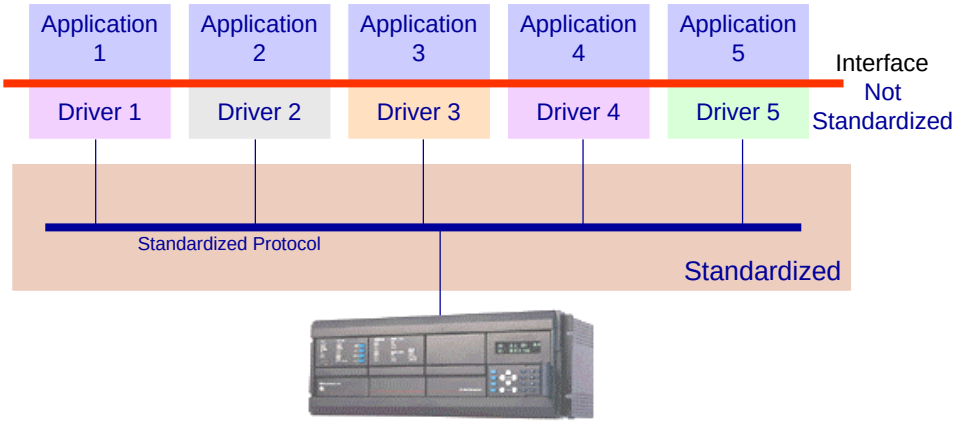




CIM and GID are Related

- Provide a common agreement on **WHAT** data is exchanged
  - The Common Information Model (CIM)
- Provide a common agreement on **HOW** to exchange the data
  - The Generic Interface Definition (GID)

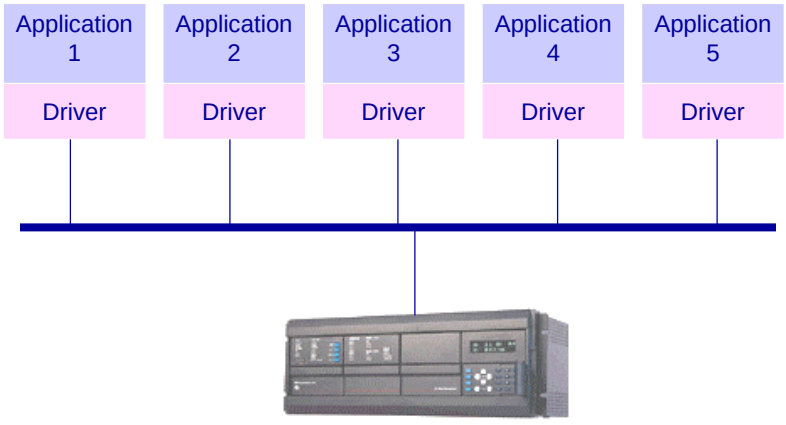
Interfacing Protocols to Applications



Impact of Lack of Interface Standards

- Each application developer had to develop drivers for all popular protocols.
- Application developers spent considerable resources on drivers instead of applications.
- Result:
  - Less application functionality
  - Higher application costs

Using Protocols: Interface Standards Useful



Interface Standards

- Enables plug and play of applications and devices
- Enables 3rd party market for drivers
  - Enables niche application players to exist
- Allows more resources for applications
- All parties have a self-interest in seeing that this works
- Results
  - More Choice
  - Less Work
  - Lower Costs
- **WIDESPREAD SUCCESS IN PROCESS AND AUTOMATION INDUSTRIES**

GID provides standardized interfaces

- GID (IEC61970) Interfaces:
  - Generic Data Access (GDA): For model management and distribution of updates.
  - High-Speed Data Access (HSDA): For access to real-time measurement data.
  - Time Series Data Access (TSDA): For access to historical measurement data.
  - Generic Events and Subscriptions (GES): For pub/sub of generic XML messages.
- GID is based on existing open standards for both energy and industrial:
  - Object Management Group (OMG): Data Access for Industrial Systems, Data Access Facility.
  - OLE for Process Control (OPC): Data Access, Historical Data Access, Alarms & Events.

GID is based on existing widely used standards

- OPC Foundation (http://www.opcfoundation.org) developed application programming interfaces to enable plug and play of applications and drivers called OLE for Process Control (OPC).
  - OPC Foundation: 362 member companies (end users and OEMs)
- OPC is dominant in the industrial automation and process control industries providing connectivity to **hundreds of key applications**.
- GID is a platform independent version of OPC supporting a model driven architecture capable of being used on any computing platform.

GID and OPC

GID Service	OPC
HSDA High Speed Data Access	DA Data Access
TSDA Time Series Data Access	HDA Historical Data Access
GDA Generic Data Access	UA Query Unified Architecture (future)
GES Generic Eventing and Subscriptions	AE Alarms & Events

- GID is platform independent AND model-driven:
  - OPC uses vendor determined namespace for data
  - GID uses a namespace derived from the CIM for all data

Web Service Based Integration

A Disclaimer

- Many many options and architectures involving languages, transport, XML, etc. can all be referred to as “Web Services”
- Simplified overview to illustrate some basic points

What are Web Services?

- A structured integration architecture using XML messaging over a similar network architecture as the world-wide web (WWW)
- Web Services:
  - Can reuse existing network infrastructure used by the WWW (Internet, Intranet)
  - Allows a client to discover the services and data supported by a server.
  - Defined by the World Wide Web Consortium: http://www.w3c.org
  - Uses a standard framework for integration development using widely deployed tools (Java (etc.), .Net, etc.)
- Web Services Do Not
  - Interpret and understand tags, values, or descriptions semantically (no standardized model)
  - Automatically connect services unless identical models are used
  - Define standardized services – only a standardize method of discovering, invoking, and managing services

The World Wide Web

- Uniform Resource Identifiers – URI
  - Provide defined ids to refer to elements on the web
  - Successor to the Uniform Resource Locator (URL)
- Hyper-Text Markup Language – HTML
  - A standardized method to describe document structures allowing browsers to render information for the human reader
  - Predecessor of eXtensible Markup Language (XML) – a more generalized language not tied specifically to document rendering
- Hyper-Text Transport Protocol – HTTP
  - A standard protocol for web clients (browsers) to communicate with web servers

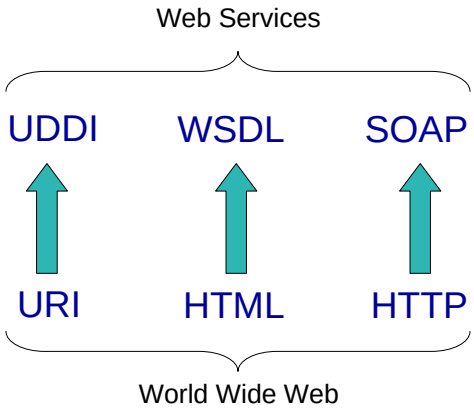
Web Services is Similar

- Universal Description, Discovery, and Integration (UDDI)
  - Framework for describing, discovering and managing web services
- Web Services Description Language (WSDL)
  - An XML format for describing the network services operating on XML messages containing either document-oriented or procedure-oriented information.
- Simple Object Access Protocol (SOAP)
  - An XML based protocol for exchange of information in a distributed environment over HTTP.

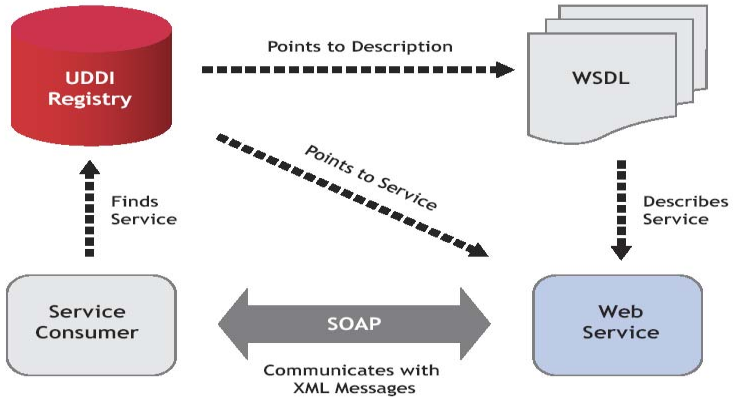
Brief Tutorial

- Web Services Description Language (WSDL) consists of:
  - Types – a container for data type definitions.
  - Message – an abstract, typed definition of the data being communicated.
  - Operation – an abstract description of an action supported by the service.
  - Port Type –an abstract set of operations supported by one or more endpoints.
  - Binding – a concrete protocol and data format specification for a particular port type.
  - Port – a single endpoint defined as a combination of a binding and a network address.
  - Service – a collection of related endpoints.
- Simple Object Access Protocol (SOAP)
  - Envelope - Describes what is in a message and how to process it
  - A set of encoding rules for expressing instances of application-defined data types within a message (e.g. the “Body”)
  - A convention for representing remote procedure calls and responses.

Web Services is Based on the WWW



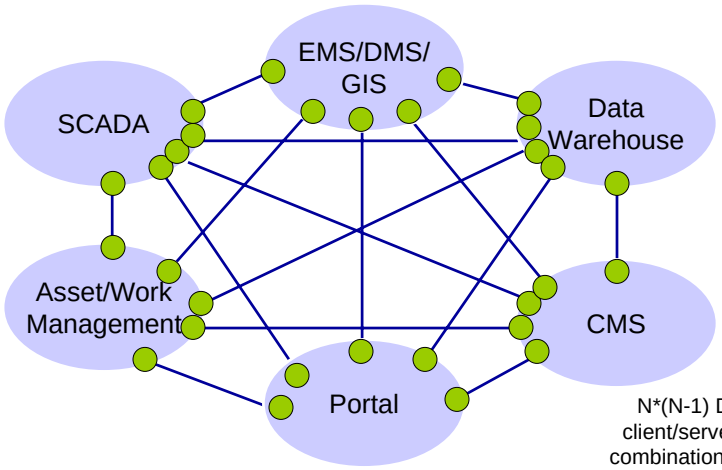
Web Services Architecture



Service-Oriented Architecture (SOA)

- A ***service-oriented architecture (SOA)*** is an application framework that takes applications and breaks them down into individual business functions and processes, called ***services***.
- Services are the building blocks of an SOA.
  - A service can be a business function, such as check customer credit or sell covered option, or a system capability such as authenticate user.
  - SOAs allow organizations to "package" business functions from new and existing applications in a simple and standardized way.
  - An SOA increases flexibility by treating elements of business processes and the underlying IT infrastructure as secure, standardized components (services) that can be reused and combined to address changing business priorities.
- **Can't maximize the value of an SOA without open standards.**

Generic Web Service Integration



N*(N-1) Different client/server service combinations requiring coding

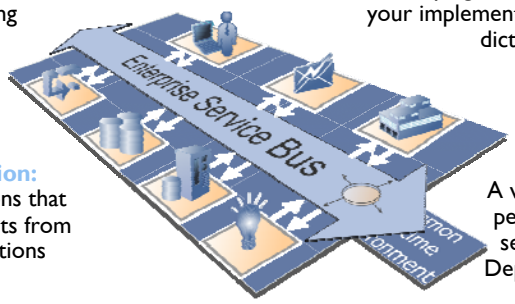
Typically no agreement on common protocols, models, services, etc.

Enterprise Service Bus (ESB) Concepts

Universal Connectivity: ***Integrates the most diverse environments, bridging protocols, languages, platforms, APIs and messaging paradigms – to provide the scale and scope of integration required by today's extended enterprise***

Service Orientation: Facilitates loose coupling between software components

Incremental Integration: Start small and plug in capability to enrich your implementation as needs dictate

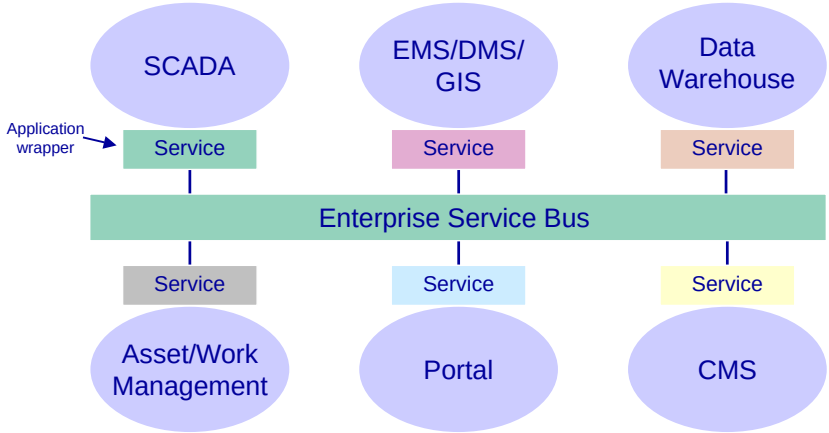


Event Orientation: Decouples applications that publish business events from subscribing applications

Flexibility: A variety of options for persistence, reliability, security, availability... Deploy where required, manage centrally

Open, standards-based: Open APIs and protocols support the interoperability and substitution of middleware from multiple vendors

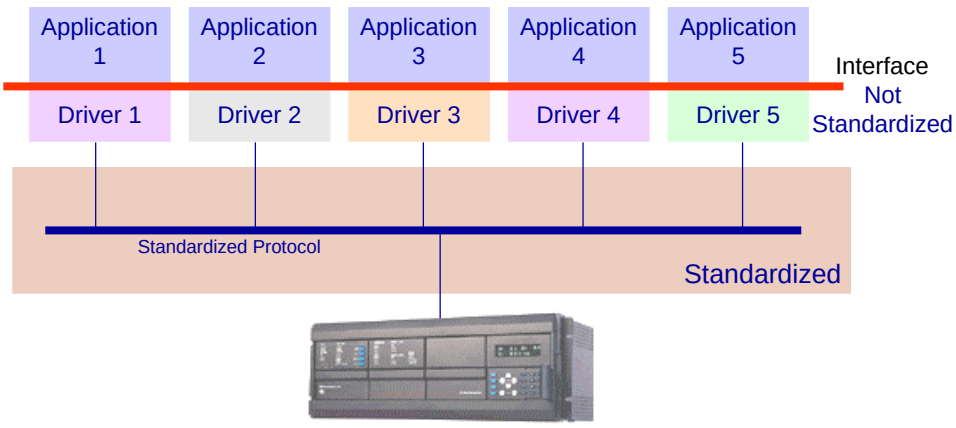
Components Connect To An ESB Using Web Services



SOA using ad-hoc web services with an ESB

- Significant benefits due to use of standards:
  - SOAP – HTTP for transport
  - WSDL to describe the services and messages supported
- Ad-hoc because each application specifies its own services
  - Each service provider independently defines their own services (WSDL)
  - Each client needing to access a service must discover and adapt to each unique web service provider.
  - Application integration requires significant programming effort unique to:
    - The specific application functions involved
    - The developer/brand of the applications
- Result: integration is customized and unique to each and every system

Remember This? Same Problem….But BIGGER



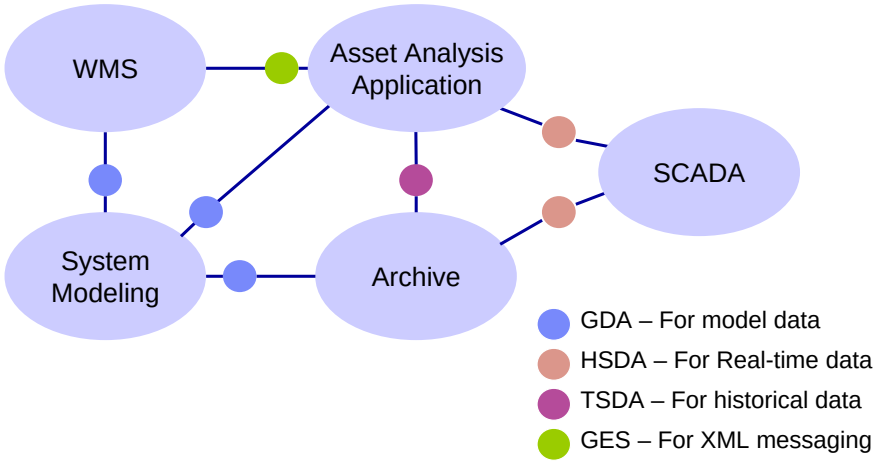
CIM and GID - Enable More Interoperability in a Web Services Environment

- Provide a common agreement on **WHAT** data is exchanged
  - The Common Information Model (CIM)
  - Standardized Data and Message Types
- Provide a common agreement on **HOW** to exchange the data
  - The Generic Interface Definition (GID)
  - Standardized Services to Exchange Data and Messages

GID provides standardized interfaces and services

- GID Interfaces:
  - Generic Data Access (GDA): For model management and distribution of updates.
  - High-Speed Data Access (HSDA): For access to real-time measurement data.
  - Time Series Data Access (TSDA): For access to historical measurement data.
  - Generic Events and Subscriptions (GES): For pub/sub of generic XML messages including IEC61968 (WG14) Messages
- Interfaces are translated into services via WSDL for each GID interfaces
  - Results in standardized web services

Integration Using GID Services



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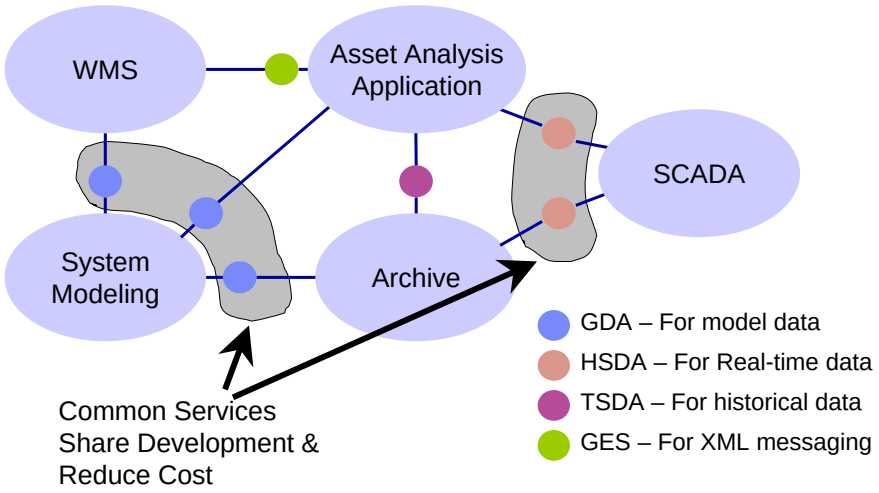
Standard Service Definitions Reduce Costs



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GID Service Definitions – Status

- IEC61970-4XX Standards (GID):
  - Committee Draft August 2005
  - Implementations planned for 2006
- Existing GID Services:
  - High-Speed Data Access (HSDA)
    - OPC Data Access XML WSDL Exists today
  - Time-Series Data Access (TSDA)
    - SISCO developed XML based on similar approach to OPC DA XML

Conclusions

- SOA and ESB and the entire web service architecture is a robust widely used integration framework:
  - Widespread tool support
  - Discovery of services and models
  - Formalized description of semantics
- Without standardization of services application integration still depends on custom code and/or configuration that makes each system unique depending on the specific applications and business functions implemented.
- Using standardized GID based services enables reduces uniqueness increasing likelihood of off-the-shelf solution and reusability of developed code reducing costs.

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Thank You

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