What Is A Completion?

The Professional Petroleum Data Management (PPDM) Association is the not-for-profit, global society that enables the development of professional data managers, engages them in community, and endorses a collective body of knowledge for data management across the Oil and Gas industry.

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Table of Contents

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A few of the many great reasons to be part of the PPDM Community.

Leverage Your Data	Analytics run at the speed of your data. In the hands of a professional data manager, **PPDM Standards** let you leverage your data faster.
Gain Efficiency	Search for oil instead of data. **PPDM Standards** help keep your data accessible for decision making. Professionals get the job done efficiently.
Drive Excellence	**PPDM Standards** build the foundation. **Data professionals** take care of the data. Combined, they let you see what others cannot see, and discover what is possible.
Build Trust	**Data professionals** manage data so it's available when you need it for decision making, or emergency management.
Deploy Technology	Wielded by **data professionals**, built on **best practices and standards**, your data is part of today's digital transformation. Leverage advanced analytics, machine learning, artificial intelligence, the Industrial Internet of Things and automation.
Inspire Peers	Industry leaders help you discover ways to **improve your skills** and find technologies to help you stay ahead of the competition.
Lead Colleagues	Be the difference, be **part of the data revolution!**
Learn New Skills	Discover emerging frontiers, learn how innovation keeps you **competitive**.

About The PPDM Association

The Professional Petroleum Data Management (PPDM) Association is the global, not-for-profit society within the petroleum industry that provides leadership for the professionalization of petroleum data management through the development and dissemination of best practices and standards, training programs, certification and professional development opportunities. PPDM represents and supports the needs of operating companies, regulators, software vendors, data vendors, consulting companies and data management professionals around the globe.

Through the PPDM Association, petroleum data experts gather together worldwide in a collaborative, round table approach to engineer business driven, pragmatic data management standards, best practices and professional development programs that meet industry needs. PPDM standards include the PPDM Data Model, *What Is A Well, Well Status and Classification, Well Identification* best practices, data rules and more. In addition to its training and certification (CPDA™) programs, PPDM professional development opportunities include symposia, expos, tradeshows, luncheons, workshops, HR support tools and student development programs.

Introduction

Technical advances in methods used to construct and prepare wells for operations have paved the way for tremendous industry growth over the last several decades. New drilling tools and measuring capabilities allow us to construct many closely spaced wellbores. Hydraulic fracturing and hydrocarbon recovery systems maximize the return from each investment.

Industry vocabularies have failed to keep pace with these advances, however. Terminology that worked well only a few years ago now introduces ambiguity and lack of clarity that can interfere with communication and the interdisciplinary connections that are essential to our industry. PPDM Association's *What Is A Well* and *Well Status and Classification* initiatives create Rosetta Stones that help harmonize corporate and regional dialects.

About *What Is A Completion*

PPDM vocabularies can serve as an aid to disambiguating how the word "completion" is used in each operating or regulatory system. It provides terminology with definitions, clarifications, illustrations and examples that can be used in any working environment to help stakeholders from different working groups, organizations or regions be sure they are communicating clearly and effectively.

The aim of *What Is A Completion* is to develop a best practice that is globally applicable, and that can both support and be independent of any specific regulatory or operator environment.

How To Use *What Is A Completion*

The material in this booklet and its supporting website* can help you translate the vocabulary that is used by different disciplines into a common vocabulary. Start with the illustrations and discover what words and definitions each user group associates with that illustration; map these into the *What Is A Completion* Standard. As you do this, your user groups will develop an understanding and appreciation of the different needs that others have; this facilitates better cooperation and collaboration.

* See www.WhatIsACompletion.org

Overview

Each role or discipline may require information from one or more facets in order to satisfy their functional requirements. The *What Is A Completion* taxonomy is based on two fundamental concepts:

Physical: The physical instance of a completion, including equipment, materials, and the methods used to prepare a wellbore interval for its intended purpose.

Business: The business processes that arise from the activities related to creating and preparing the wellbore, including outcomes and obligations.

About Faceted Taxonomies

This standard is a faceted taxonomy; these systems recognize that various business functions may describe or identify an object in different ways. In a faceted taxonomy, each facet describes a functionally distinct property of an object. While facets may be hierarchical in nature, instances of each facet can be unambiguously described to support interoperability.

Defining Uniqueness

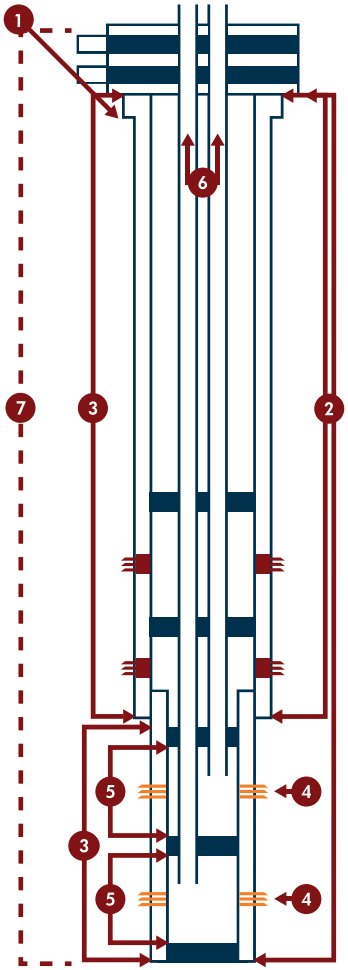
Each component in the *What Is A Completion* faceted taxonomy can be defined through a unique set of observable properties (attributes). Recommendations for an agreed set of attributes are contained in this document.

Attributes that describe, but do not define, a unique instance of a component are also important for various business purposes. Data managers should determine the most accurate source for "defining" and "describing" attributes as part of a master data management strategy for "completions".

Companion Best Practices at PPDM.org

- *What Is A Well*
- *Global Well Identification*
- *Well Status and Classification*

Well Components



Active Perforation

Squeezed Perforation

1. **Well Origin**
   A Well Origin is the location on the surface of the earth or sea bed where the drill bit is planned to penetrate, or does penetrate the earth, to establish or rework a Well.

2. **Wellbore**
   A Wellbore is a path of drilled footage, from the Well Origin (top/start) to a terminating point (bottom/end).

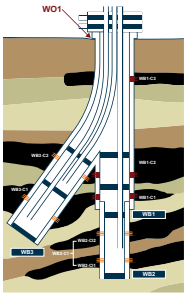
3. **Wellbore Segment**
   A Wellbore Segment is a unique drilled interval within the Well, either the original Wellbore from the Well Origin to the terminating point, or additional footage from a point in an existing Wellbore to a new terminating point.

4. **Wellbore Contact Interval**
   A Wellbore Contact Interval is a measured depth range within a Wellbore that is intended to put the Wellbore into contact with one or more stratigraphic zones for the purpose of production, injection or service.

5. **Wellbore Completion**
   A Wellbore Completion is a set of one or more Wellbore Contact Intervals that function as a unit to produce or inject fluids.

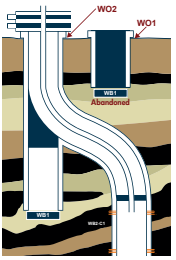
6. **Wellhead Stream**
   A Wellhead Stream is a flow of fluids through a conduit determined by an installed wellhead configuration.

7. **Well Reporting Stream**
   A Well Reporting Stream is a derived stream of fluids to support the allocation and aggregation of volumes.



Well

A proposed or actual drilled hole in the ground designed to exchange (or facilitate the exchange of) fluids between a subsurface reservoir and the surface (or another reservoir), or to enable the detection and measurement of rock properties.

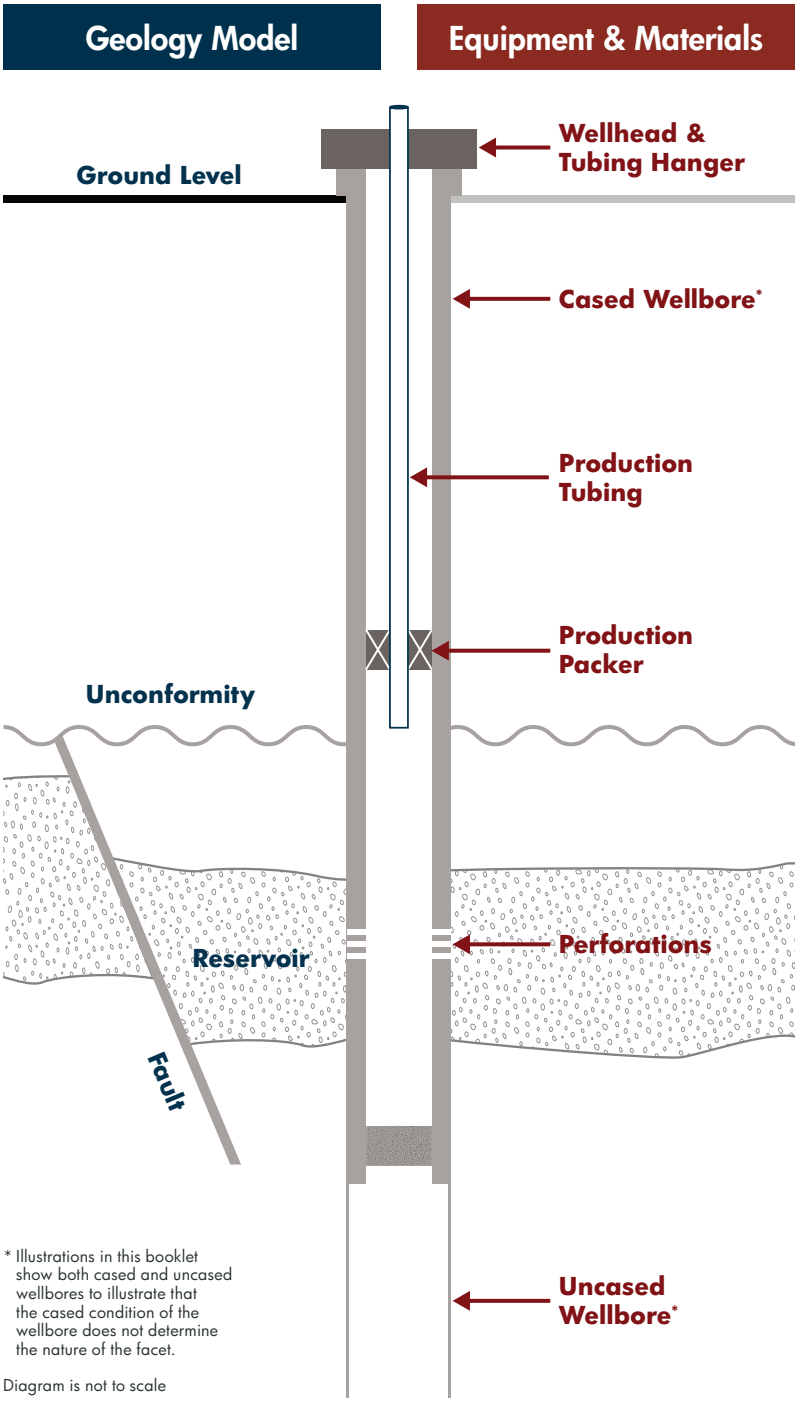


Well Set

A grouping mechanism for Well Components used to maintain an end-to-end link through all stages of the Well life cycle (planning to disposal).

Source: WhatIsAWell.org

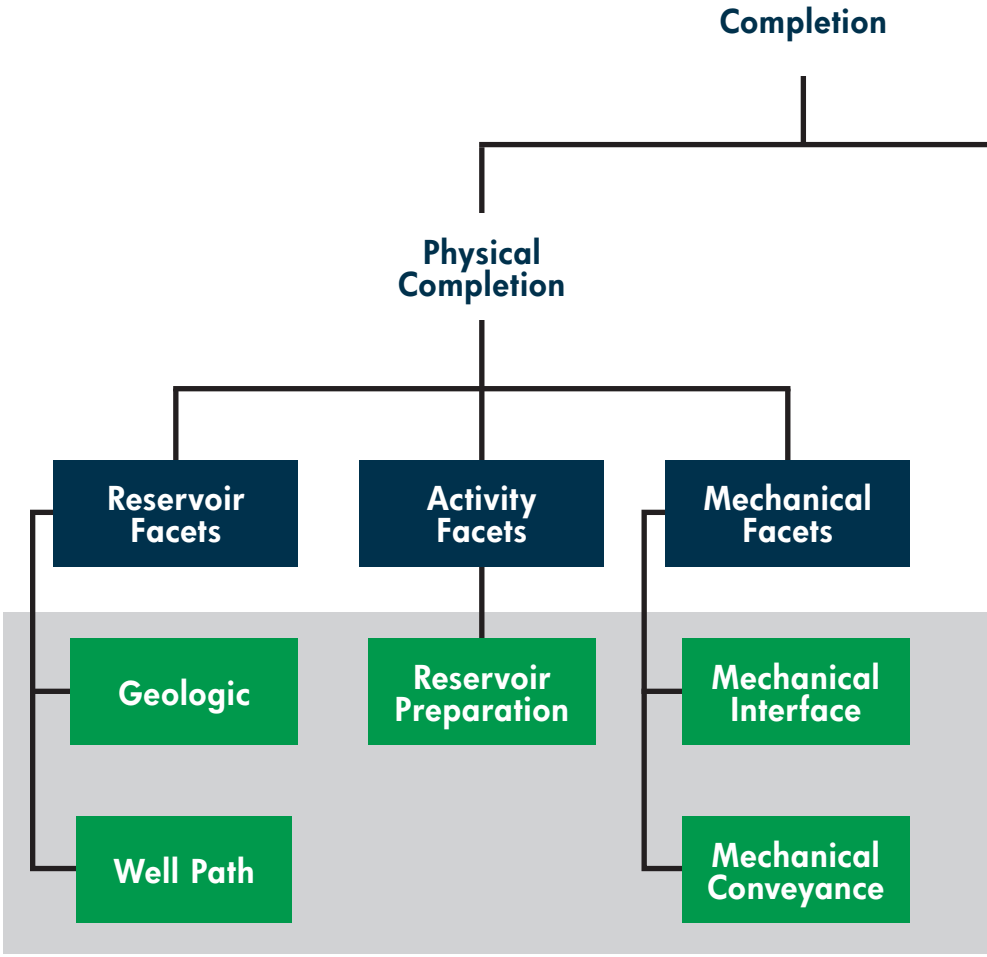
Guide to Illustrations



* Illustrations in this booklet show both cased and uncased wellbores to illustrate that the cased condition of the wellbore does not determine the nature of the facet.

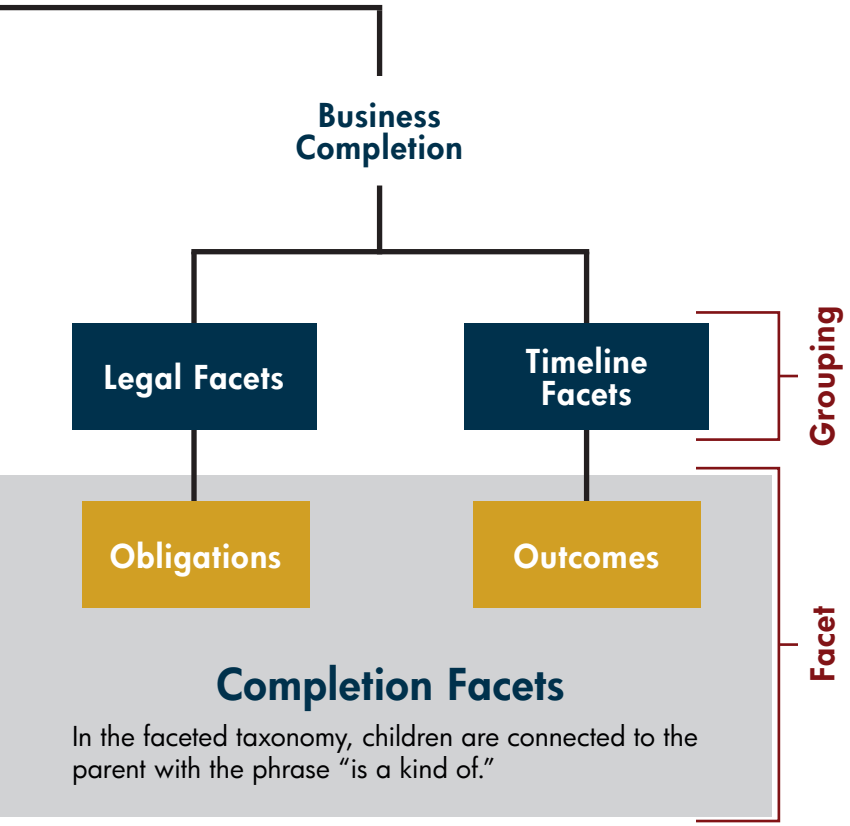
Diagram is not to scale

Taxonomy



The term "completion" is divided into two key concepts.

Physical Completion contains facets that, taken as a set, fully describe the equipment, materials and methods used to prepare part of a wellbore (or multiple wellbores) for operations. Physical Completions are further divided into facets that describe the reservoir, the activities and the mechanical components.



Completion Facets

In the faceted taxonomy, children are connected to the parent with the phrase "is a kind of."

Business Completion contains facets that describe business functions or processes that arise from the process of preparing wellbores for operations. Sometimes, these may arise even in the event of an unsuccessful outcome, such as a dry hole. Business Completions are divided into facets related to legal obligations arising from legislation or contractual terms, and facets related to outcomes during the well life cycle (timeline).

Geologic Facet

Definition

The location, in three dimensions, of predicted, planned and observed rocks and fluids in a reservoir.

Key Concepts

The Geologic Facet represents the reservoir in the context of a geoscience earth model, a reservoir characterization model or a reservoir simulation model.

Related Terms

- Earth Model
- Reservoir Characterization
- Target Reservoir

Clarification

This facet describes the target reservoir as a fluid system, including the relevant portions that do not contain commercial hydrocarbons. As fluids are produced or injected, the facet remains constant. However, the understanding (model) of the facet evolves as additional information is acquired throughout the life cycle of the well.

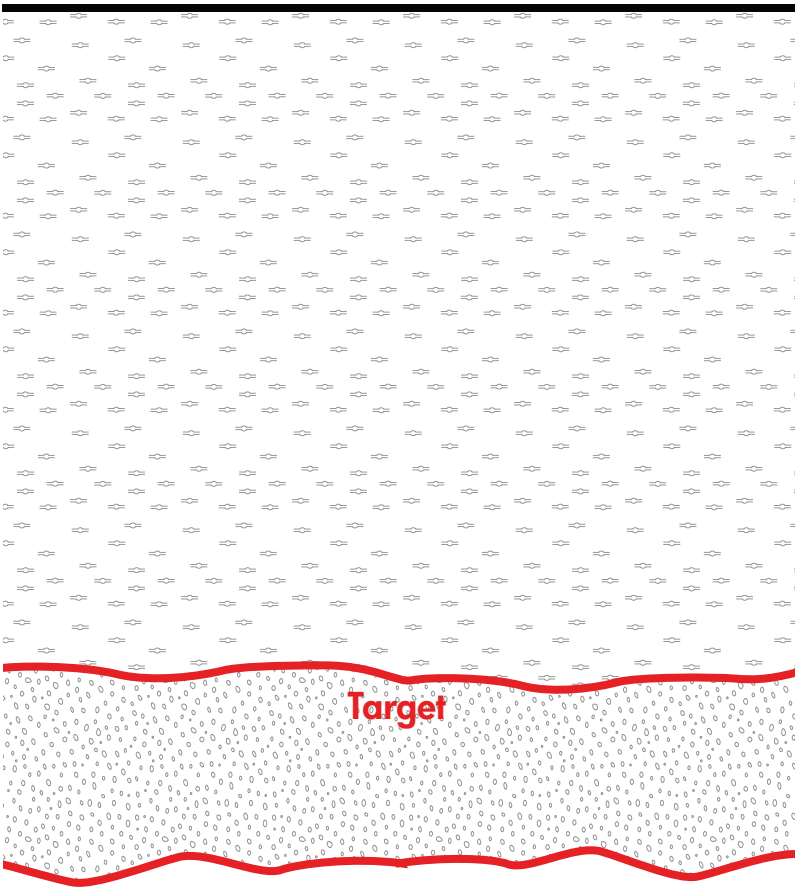
The Geologic Facet represents the reservoir; the Wellbore Contact Interval (WBCI)* allows you to access the Geologic Facet. They have a functional relationship, but the two may not intersect in a predictable fashion. The Geologic Facet is dynamic in its reaction to what we do, while the WBCI is relatively static and mechanical (we can control it).

A 3D earth model is essential for defining and planning the well intersection(s). The model becomes increasingly accurate as new data is received through the life of the reservoir. This facet extends beyond the wellbore to contribute to an earth model as evidence is received through logs, cores, tests and other data.

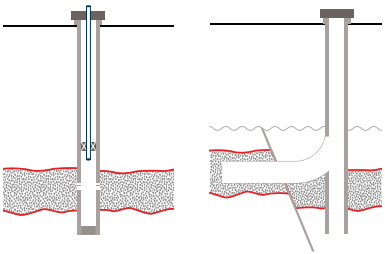
This facet overlaps with the concept of reservoir characterization in the use of a continuously improving reservoir model to optimize the location of contact intervals as a function of evolving rock and fluid properties.

* See *What Is A Well*, page 4

Geologic Facet



Examples



These illustrations show the evolution of one Geologic Facet from planning (pre-drill) to first production (vertical well) to new drilling (uncased lateral) after recognition of a faulted reservoir offset. In this example, the faulted section is not a new facet because there is pressure continuity

Well Path Facet

Definition

The planned or actual measured depth interval within a wellbore that intersects with a target reservoir.

Key Concepts

Wellbore Contact Interval (WBCI)* is the part of the Well Path Facet that is in contact with the reservoir. One WBCI could possibly correspond to more than one Well Path Facet.

The Well Path Facet encompasses the total length of the wellbore that is in the target reservoir, whether or not it is a producing or prepared interval.

The planned and actual well paths do not have to be the same.

Related Terms

- Earth Model
- Reservoir Properties

Clarification

If the wellbore exits and re-enters the same reservoir, a new Well Path Facet is created starting from where it re-enters the reservoir, because although the intersection is with the same reservoir, not all the intersections may be treated the same.

The Well Path Facet may exist even if the well is never drilled or if reservoir preparation is never done.

The top and bottom of the Reservoir Preparation Facet interval do not have to correspond to the entire Well Path Facet interval.

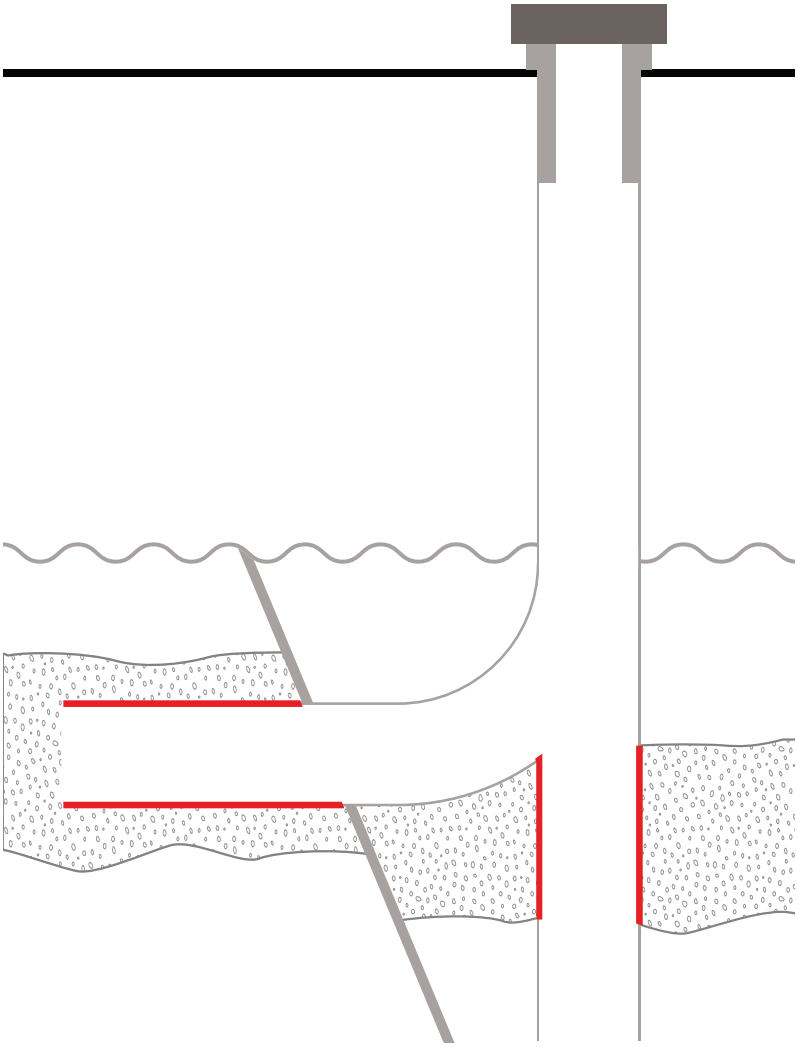
As the understanding of the reservoir matures, what is called the "same" reservoir may change; top and bottom measured Well Path intervals are interpreted and can change with new geologic interpretations.

A Well Path Facet may contain more than one Reservoir Preparation Facet and one Reservoir Preparation Facet may span multiple Well Path Facets.

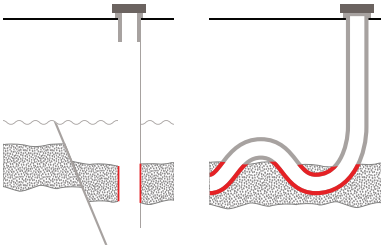
Well Path Facet is the part of the wellbore from the top of the reservoir to the base. It can have one or more WBCI in it.

* See *What Is A Well,* page 4

Well Path Facet



Example



The illustrations show that there can be one or multiple Well Path Facets in the same Geologic Facet.

Reservoir Preparation Facet

Definition

Activities that prepare the reservoir for production or injection through the wellbore by changing reservoir flow characteristics.

Key Concepts

Includes perforations which create the interface and treatments which are applied to the reservoir.

Reservoir preparation changes the properties of the reservoir (e.g. hydraulic fracturing) or repairs drilling damage (e.g. acid wash).

Reservoir preparation consists of a series of activities (jobs) usually conducted by service companies, and which spans both the initial reservoir preparation and subsequent maintenance or workover activities, provided they change reservoir flow characteristics.

Related Terms

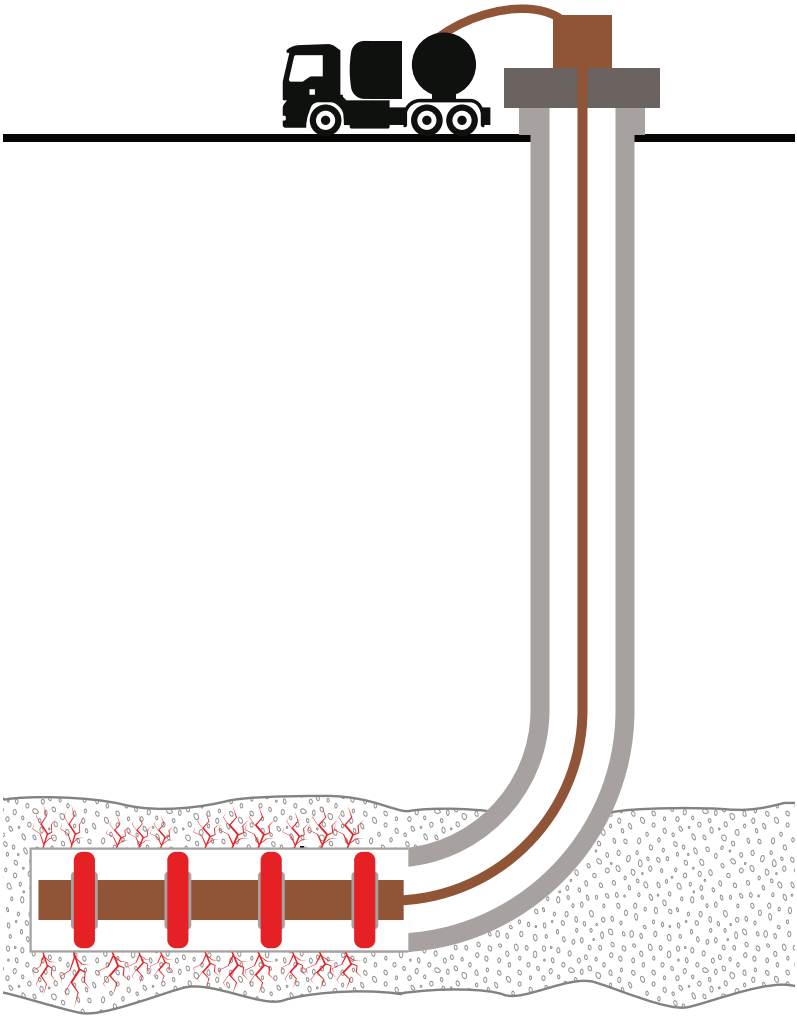
- Hydraulic fracture
- Stimulation
- Workover
- Recompletion

Clarification

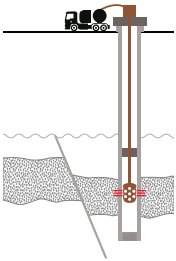
Regulatory approval requirements and reporting obligations vary, depending on the type and extent of work.

Workover or maintenance processes that do not alter reservoir flow characteristics, such as changing a tubing string, are not considered to be included in the Reservoir Preparation Facet (this is maintenance).

Perforations are a part of this facet because they alter the flow properties of the reservoir near the wellbore.



Example



Surface and subsurface equipment and materials are used in the reservoir preparation operations.

Mechanical Interface Facet

Definition

Equipment that controls the flow of fluids at the contact interval(s) between the reservoir(s) and the production conveyance mechanism.

Key Concepts

This facet describes each independently controlled set of equipment by which fluid flow between the production conveyance mechanism and the reservoir is managed.

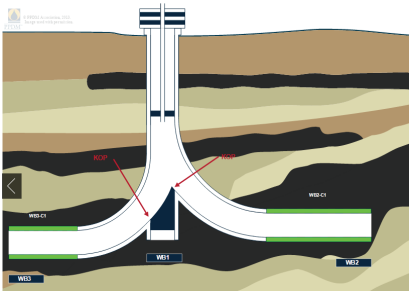
Related Terms

- Upper, intermediate or lower completion (referring to various reservoirs in a well).
- Lower completion (referring to installed equipment at or near the reservoir interface).

Clarification

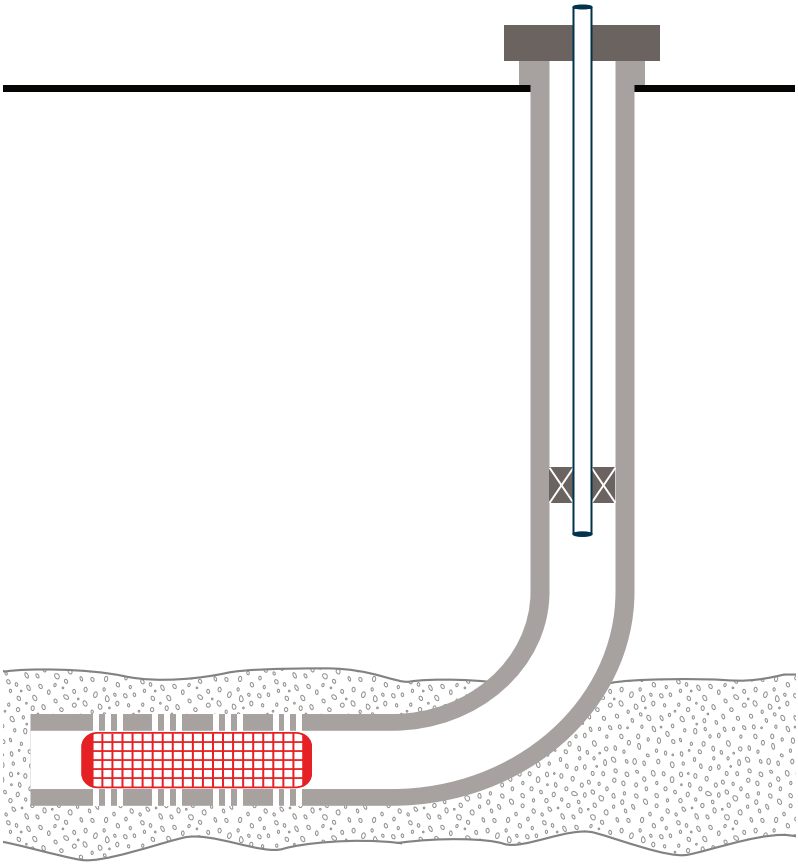
A new Mechanical Interface Facet may require contractual or regulatory approval, or may incur a change in obligations.

In some multilateral configurations, a Mechanical Interface Facet controls fluids in more than one Wellbore. Within each leg, the Mechanical Interface Facet has a unique combination of wellbore identifier and contact interval but could share one production conveyance above the junction of all the laterals.

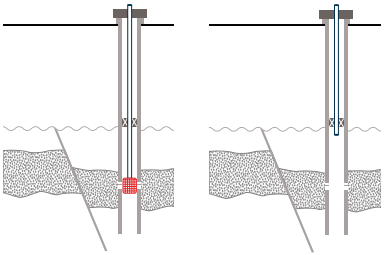


Source: *What is a Well*

If there is no fluid flow control mechanism installed below the production conveyance, there is no physical Mechanical Interface Facet.



Examples



The first example, left, shows a sand control screen at the interface. The second is a completion with no interface equipment.

Mechanical Conveyance Facet

Definition

Equipment that controls and transports fluid in either direction between the base of the tubing and the tubing hanger.

Key Concepts

Includes equipment that allows fluids to move between the reservoir interface control and the surface (including, but not limited to, production packers, valves, tubing strings, lifting equipment, etc.)

The specific equipment configuration may change over time and may belong to more than one Mechanical Conveyance Facet, because changes in installed equipment can result in changes to the flow of fluids, and certain equipment may control more than one flow of fluids.

Related Terms

- Production string
- Production conveyance (although this implies direction)
- Upper completion (used especially by service companies)

Clarification

The Mechanical Conveyance Facet consists of many pieces of equipment, each of which is uniquely identified (serial number) and has its own maintenance requirements.

The wellbore may have more than one set of Mechanical Conveyance mechanisms.

The installed equipment may create an annulus used for the fluid flow.

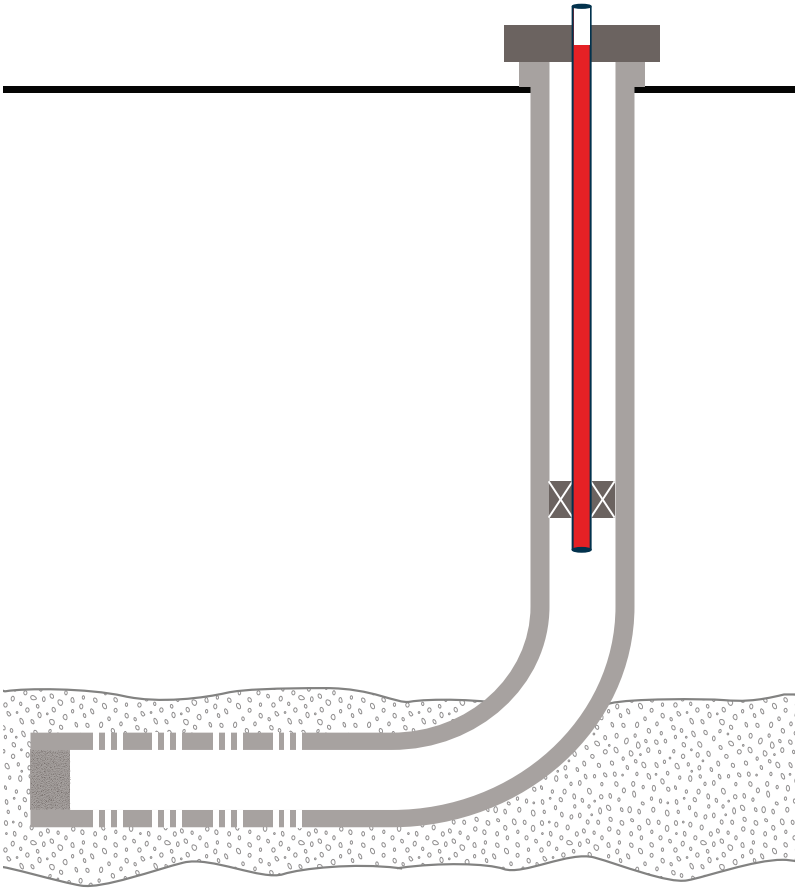
Regulatory requirements vary for configuring and reporting the Mechanical Conveyance Facet.

The top of the facet normally ends at the tubing hanger. The base of the facet normally ends at the base of the tubing, which may extend slightly below the packer or tubing anchor, if one exists.

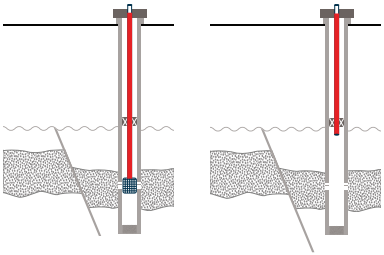
Surface facilities are essential but not part of this facet.

Equipment that is temporarily installed for completion or maintenance activities is not included.

Mechanical Conveyance Facet



Example



The mechanical conveyance may include artificial lift equipment within the well or directly related on the surface, e.g. sucker rods and pump jack, electric submersible pump, compressor.

Obligation Facet

Definition

A required business action that results from a Physical Completion event, as specified by regulations or a contractual relationship.

Key Concepts

As well construction or operations proceed, legal or regulatory obligations are triggered, often at the conclusion of a work phase.

The requirements specified by each obligation may be fulfilled through submission of information, monetary transaction, completion of work, by obtaining permission or consent, etc.

Related Terms

- "completion" or "completed" may be embedded in the formal or informal name given to a report, submission or document (e.g. Well Completion Report).
- "completion" may refer to the conclusion of an activity or series of activities.

Clarification

The nature of the obligation is set forth in a legal document, such as a contract or regulation.

Obligations are usually time dependent, have specific trigger events, and have specific deadlines.

Obligations are enforceable. Failure to fulfill them may result in a penalty or litigation.

The definition of Completion in legal works is variable, and not consistently defined through terms in common use, such as "recompletion," "workover" or "completing." Sometimes this term appears in a legal document but is not clearly defined; readers should seek clarification when this happens.

Legislation establishes and empowers the application and enforcement of regulations. Contracts are formal, legally binding agreements. Examples include: well license, Joint Venture Agreement, Joint Operating Agreement and completing permits.

Regulations **Contracts** **Analysis**

Specifics about the nature of the triggering event vary greatly. Examples may include: spud date, date of first production, date of tie-in to transportation network, date decision to complete is made, authorization date, lease condition deadlines.

Some obligations are scheduled, and not triggered by a specific activity. Examples include monthly reporting, royalty reporting, or reserves reporting.

Examples

At the conclusion of specified processes, regulators or partners may require information, a recommendation from the operator, or a recommendation about next steps.

- At the conclusion of well testing, the operator may be required to obtain partner consent to prepare the well for operations.
- A regulator often provides specific consent for a well to be put on production once construction has been finished.

Many regulatory agencies require the filing of a "Well Completion" report with a summary of operations conducted and their outcomes.

Outcome Facet

Definition

An Outcome related to a completion describes the current condition of a well, wellbore or well site, generally as the result of operations that have been concluded.

Key Concepts

Outcome is often inferred by the presence of the term "Completion" or "Completed."

The terms "Completion" and "Completed" have highly variable uses. You are advised to seek specific clarification on the meaning of each usage by the owner of the term.

Related Terms

Terms referring to the outcome of operations may be found in status lists, such as:

- Well Status or Well Type
- Well Role or Function

Clarification

These terms are often found in Well Status or Well Type values used by regulators. Terms and definitions used by each regulator may be set out in legislation or regulation.

Regulatory change may not keep pace with technological advancement, resulting in some terms having ambiguous or even multiple meanings.

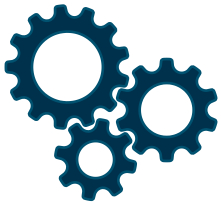
Definitions may be included in standard operating practice but are not well documented.

Outcome terms may have more than one definition, even in a single business owner (see Example). In some cases, you may need more information to derive the full meaning of a term.

Outcomes may sometimes be inferred by the presence or absence of information. For example, a well that is producing oil is generally assumed to have progressed through the life cycle stages of drilling, reservoir preparation, and installation of Mechanical Interface Facet and Mechanical Conveyance Facet components.

Uses of this term may be associated with mapping symbols.

Produce



Rework

Dispose

Example

This example is from a Regulatory Agency that defines the term "completion" in several ways, depending on context. The meanings are not endorsed by *What Is A Completion*. The purpose is to illustrate how "completion" has multiple meanings when applied to the Outcome of a well.

Well Completion

May mean any of the following:

- *A well has been tested and found to be incapable of producing hydrocarbons in commercial quantities and has been plugged.*
- *A well has been found to be capable of producing commercial quantities of hydrocarbons.*
- *A well has been equipped to perform the service for which it was intended.*

Final Completion

The time when locating, drilling, deepening, converting, operating, producing, reworking, plugging, and proper site restoration have been performed on a well in a manner approved by the supervisor, including the filing of the mandatory records, and when the conformance bond has been released.

Plugging Completed

The status of a well that is plugged to the surface (except for directional re-drills) awaiting final review and approval of records and site restoration.

Summary

Completion

Physical Completion

Reservoir Facets

Activity Facets

Mechanical Facets

Geologic

The location, in three dimensions, of predicted, planned and observed rocks and fluids in a reservoir.

Well Path

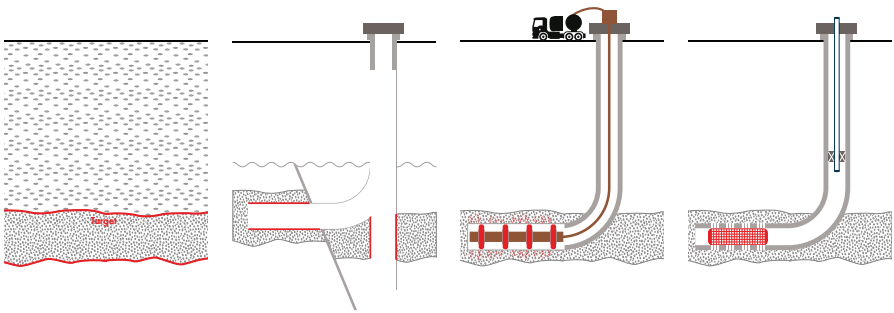
The planned or actual measured depth interval within a wellbore that intersects with a target reservoir.

Reservoir Preparation

Activities that prepare the reservoir for production or injection through the wellbore by changing reservoir flow characteristics.

Mechanical Interface

Equipment that controls the flow of fluids at the contact interval(s) between the reservoir(s) and the production conveyance mechanism.



Page 8 - 9 Page 10 - 11 Page 12 - 13 Page 14 - 15

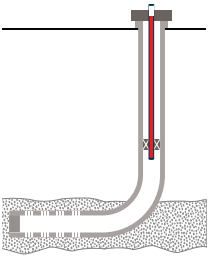
Business Completion

Legal Facets

Lifecycle Facets

Mechanical Conveyance

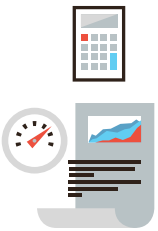
Equipment that controls and transports fluid in either direction between the base of the tubing and the tubing hanger.



Page 16 - 17

Obligation

A required business action that results from a Physical Completion event, as specified by regulations or a contractual relationship.



Page 18 - 19

Outcome

An Outcome related to a completion describes the current condition of a well, wellbore or well site, generally as the result of operations that have been concluded.

Page 20 - 21

Facet	Planning	Drilling	Completing	Producing	Disposing
Geologic	Evolving				
Well Path	Planned / Actual				
Reservoir Preparation			Iterative		
Mechanical Interface			Iterative		
Mechanical Conveyance			Iterative		
Obligations	Ongoing				
Outcomes	Well Status And Classification				

The work of creating and managing a completion spans the life of a well. Certain facets are chiefly within one or more of the lifecycle phases defined by the PPDM *Well Status and Classification* Standard.

Early in the planning stages, geologic models estimate the size, shape and nature of the anticipated reservoir. As operations progress to drilling, technical data is created that allow estimates to become increasingly accurate. The Geologic Facet may change through these stages several times.

An intended well path is designed during the planning stage. The actual Well Path Facet that is created during drilling operations may not precisely correspond to the planned path, as trajectories are revised during drilling based on physical conditions and the technical analysis of logging or core data.

Activities that put the Well Path Facet into contact with the reservoir range from very complex multi-stage fracturing operations to simple open hole arrangements. Through its life, the Well Path Facet may be maintained or entirely re-worked to maximize the productivity and life span of the interval, as determined by technical specialists.

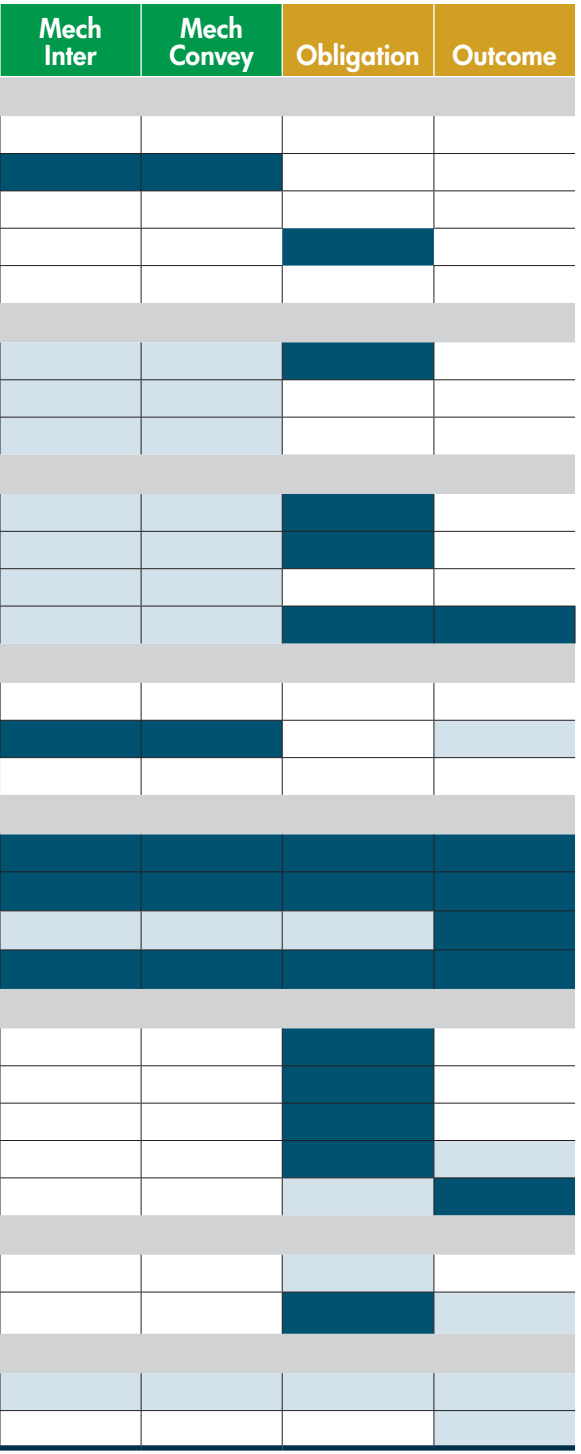
The set of equipment used to establish a Mechanical Interface Facet between the reservoir and the Well Path Facet may be changed for maintenance or to modify the interface over time.

The set of equipment used to convey fluids between the Mechanical Interface Facet and the surface may be changed for maintenance or to modify the interface over time.

The exact nature of financial, work or approval obligations vary depending on the legislative or contractual environment in which work is done. In most cases, obligations are event triggered, and may occur during any stage of the well life cycle.

Each life cycle phase may have different outcomes; often these are associated with well status or well classification codes. A faceted taxonomy of *Well Status and Classification* is available at www.PPDM.org.

Defining and Describing Attributes	Geologic	Well Path	Reservoir Prep
Geological or Formation attributes			
Formation Interval, Top and Base	■	■	
Measured Wellbore (WIAW) depths		■	■
Formation name	■	■	■
Pool or reservoir name	■	■	
Rock and fluid properties / contacts			
Spatial coordinates			
Latitude/Longitude/CRS - surface	■	■	
Reference Elevations and Depths		■	
Directional survey			
Activity Attributes			
Activity at the wellsite			■
Start and end dates of each activity			■
Depth or formations of activity			■
Planned / predicted vs actual	■	■	
Equipment and Material Attributes			
Equipment types used, non permanent			■
Equipment (SN) installed/removed, depths, dates			
Materials used / produced			
Well / Wellbore Attributes			
Well Origin (WIAW)		■	■
Wellbore Identifier	■	■	■
Well / Wellbore Status and Classification (WSC)		■	
Technical Data	■	■	■
Legislation or Contract Terms			
Compliance requirements			
Obligation type (payment, work, approval)			
Due dates, schedules or events			
Completed dates, events or activities			
Outcome terms and definitions			
Financial attributes			
AFE			
Financial transactions (pay or receive)			
Unstructured Data attributes			
Documents and reports			
Maps			



Data systems used to define and describe the facets of a completion will rely on attributes that define a new instance of a completion facet, and attributes that describe each instance. Attributes may capture information about things or activities and events.

The chart highlights some key attributes that should be captured in a data system. It is not a complete list.

Legend

- = Attributes that define a unique new instance of a completion facet.
- = Attributes that describe each instance of a completion facet but do not define uniqueness.

WIAW = *What is A Well*

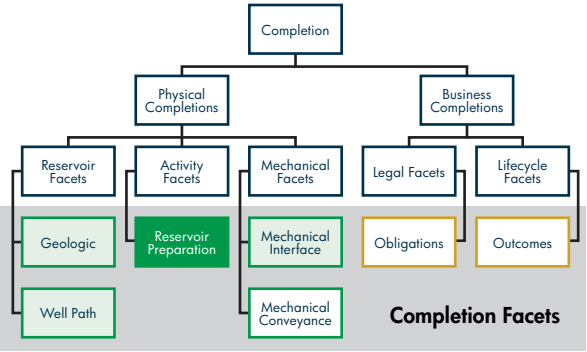
Facet Instance Management

Facets	A new instance of the facet
Geologic	• Each interpretation or model is a new Geologic Facet instance. • Multiple Geologic Facet instances may be created; of these, one is considered to be the most accurate at any given time.
Well Path	• Each change to a planned or actual Well Path Facet is a new instance. • Planned paths may be combined or divided based on new analysis or field outcomes.
Reservoir Preparation	• Every new "job" creates a new Reservoir Preparation instance. Jobs may span one or more time intervals, consist of one or more sets of downhole activities, and involve many suppliers. • Maintenance activities create a new instance.
Mechanical Interface	• When equipment is installed or the controlled interval is changed, a new instance of the Mechanical Interface is created.
Mechanical Conveyance	• When new equipment is installed or the top or base of the conveyance interval is changed, a new instance of the Mechanical Conveyance Facet is created.
Obligation	• Each instance of a tracked obligation should capture only one obligation. • Obligations can be related to other obligations, and combined into logical sets, such as all the requirements in an article of a regulation.
Outcome	• Each kind of outcome creates a new instance. • Outcomes that come from different sources may have the same name but must be treated as different instances.

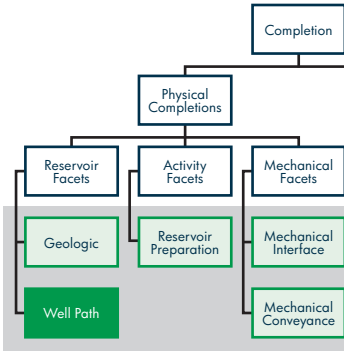
Data systems used to define and describe the facets of a "completion" can support interoperability by being consistent in defining how a new instance of a facet is created, and how a new version of an existing facet should be created. Consistent, objective and practical data rules for creating new instances and versioning an existing instance are critical to interoperability. These rules must consider whether the data manager can discern the difference consistently and objectively, and whether

A new version of an existing facet	Key Differentiators
• New information is added to the same model, enhancing the detail or trust in the model.	• New data is obtained and interpreted. • A new model will normally have a different name or identifier.
• Correcting minor errors in an existing facet may create a new version.	• Changes are supported by new data evidence. • The Well Path Facet is adjusted as the Geologic Facet evolves.
• No versions are allowed, a new instance is always created.	• Work is done to alter the reservoir characteristics. • Equipment, make or model and placement are not differentiators – all create a new instance.
• No versions are allowed, a new instance is always created.	• Equipment or depth interval changes create a new instance of the Mechanical Interface.
• No versions are allowed, a new instance is always created.	• Equipment or depth interval changes create new instances of the Mechanical Conveyance Facet.
• Obligations that recur over time may be versioned, so that each time-based version can be separately tracked.	• Each obligation is a unique expectation for reporting, paying fees or authorization.
• Outcomes that are time or situation dependent may create versions, provided that the time or situation is captured.	• The nature of outcomes may depend on regulatory or contract requirements. • Outcomes with the same name should not be combined without consideration.

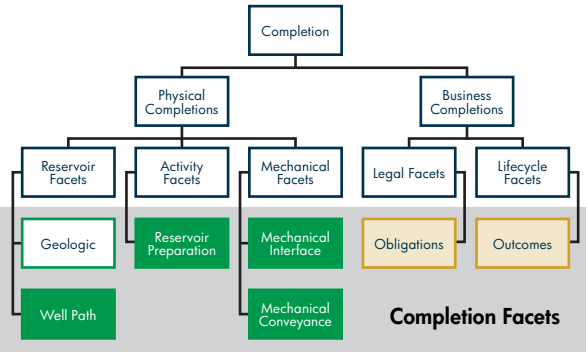
the necessary information will be available during a data load. As a result, the rules used by a data manager may not be the same as those used by an engineer or geoscientist. This chart provides recommendations about how version control of the Completion Facets should be managed in a data system in order to support interoperability.



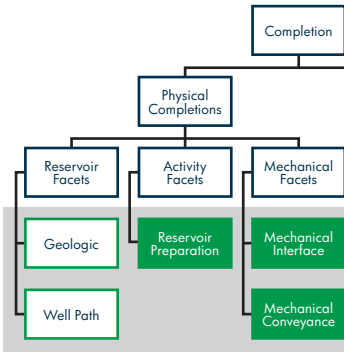
Reservoir Engineer



Drilling Engi



Production Engineer



HSE Field Insp

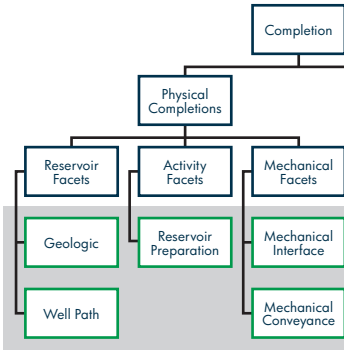
Legend

Primary Focus

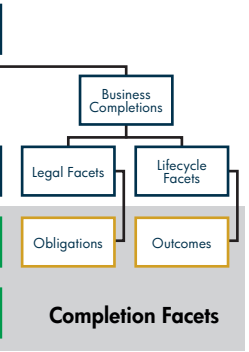
Secondary Focus

Many disciplines support well life cycle processes, each requiring specific kinds of "completion" information. Information that is critical to one discipline may be less important or irrelevant to another.

These charts do not imply that a discipline is only interested in the highlighted facets. The charts are generalizations for a wide range of disciplines.



Regulatory Filing



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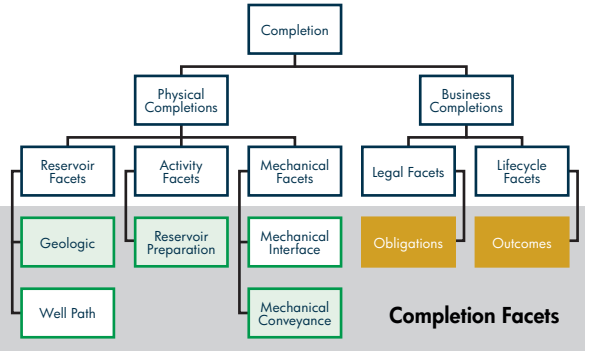
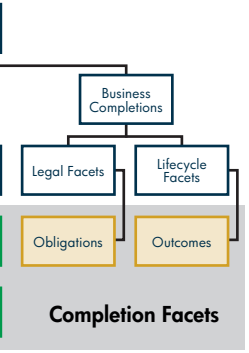


Production Accountant



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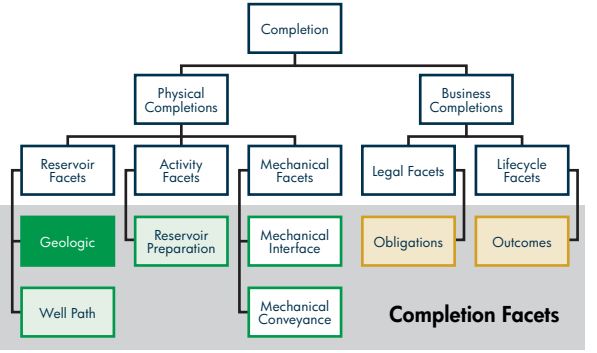
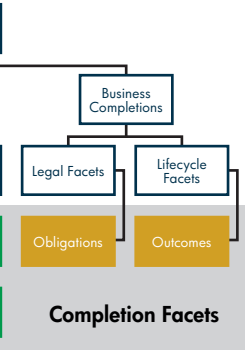
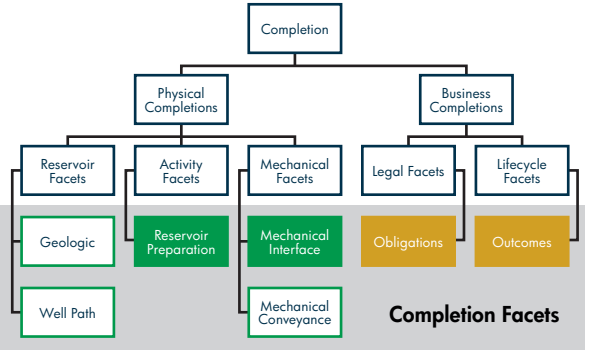


Geoscientist



(Operator)



Regulatory Filing (Regulator)

Facets	Geologic	Well Path	Reservoir Preparation	Mechanical Interface
Geologic	Geologic Facets may intersect or overlap each other as needed.	The Well Path Facet is defined by its intersection with the Geologic Facet. Each Geologic Facet may contain one or more Well Path Facets.	Reservoir Preparation enhances the reservoir's performance, and may alter its characteristics.	The Mechanical Interface Facet allows fluid flow from/to the reservoir to be controlled.
Well Path		During the life cycle, planned Well Paths may overlap or intersect, but each physical Well Path Facet is unique.	Each Reservoir Preparation may be done through all or part of one or more Well Path Facets.	Each Mechanical Interface Facet may be contained by all, or part of one or more, Well Path Facet.
Reservoir Preparation			Multiple Reservoir Preparations (jobs) have a cumulative effect on the reservoir.	Mechanical Interface design is influenced by Reservoir Preparation design and execution.
Mechanical Interface				Each modification of the Mechanical Interface Facet results in a new instance.
Mechanical Conveyance				
Obligation				
Outcome				

This chart provides a partial list of the kinds of relationships that the Completion

Completion Facet Relationships

Mechanical Conveyance	Obligation	Outcome
Each Mechanical Conveyance Facet may convey fluids from one or more geologic intervals defined by the Geologic Facet.	Obligations, such as production reporting, may be fulfilled at the reservoir, field or pool level.	Outcomes from each Well Path Facet are used to evaluate the technical and economic capacity of the Geologic Facet.
Mechanical Conveyance Facet extends to the surface within a wellbore; it is not confined to the Well Path Facet.	Obligations such as those arising from partnership agreements may be defined partly by one or more Well Path Facet.	Within each Well Path Facet, one or more outcomes may be recorded. These outcomes may change over time.
Reservoir Preparation planning takes into account the capability of the Mechanical Conveyance to determine if changes are needed.	Certain types of Reservoir Preparation may incur significant obligations before, during, and after the job.	Each Reservoir Preparation results in one or more Outcomes.
A Mechanical Conveyance Facet transports fluids from/to one or more Mechanical Interface Facets.	Different types of Mechanical Interfaces may incur obligations, particularly for regulatory Obligations.	Mechanical Interfaces may be revised in an effort to improve an Outcome.
Each change to a Mechanical Conveyance Facet creates a new Mechanical Conveyance Facet.	Measurements taken at the Mechanical Conveyance Facet, such as volumes, may be used to assess Obligations.	Measurements taken at the Mechanical Conveyance Facet, such as volumes, may be used to establish Outcomes.
	Obligations may be related to, or independent of, other Obligations.	Obligations may be assessed based on an Outcome as defined by contract or law.
		Each Well has one or more Outcomes, and Outcomes can change over time.

Facets have with each of the other Completion Facets.

		What Is A Completion Facets		
		Geologic	**Well Path**	**Reservoir Preparation**
***What Is A Well* Components**	**Well Set**	Each Well Set may intersect with one or more Geologic facets.	A Well Set may contain one or more Well Paths.	Each Well Set may be involved in one or more Reservoir Preparations.
	Well	Each Well may intersect with one or more Geologic facets.	A Well may contain one or more Well Paths.	Each Well may be involved in one or more Reservoir Preparations.
	Well Origin	Each Well Origin is selected to efficiently access a reservoir.	Each Physical Well Origin is the origin for one or more Well Paths.	Work done during a Reservoir Preparation is usually conducted through the Well Origin.
	Wellbore	A Wellbore may span one or more Geologic Facets, and each Geologic Facet may contain one or more Wellbores.	Each Well Path is contained in a Wellbore.	Each Reservoir Preparation is conducted through a Wellbore.
	Wellbore Segment	A Wellbore Segment may span one or more Geologic Facets, and each Geologic Facet may contain one or more Wellbore Segments.	Each Well Path may be contained by one or may span more than one Wellbore Segments.	Wellbore Segment does not usually correspond with the Reservoir Preparation interval.
	Wellbore Contact Interval	A Wellbore Contact Interval is usually contained within a Geologic Facet Interval.	Typically, a Well Path will contain one or more Wellbore Contact Intervals.	Each Reservoir Preparation results in one or more Wellbore Contact Intervals.
	Wellbore Completion	A Wellbore Completion may be part of one Geologic Facet, or multiple Geologic Facets may contain the Wellbore Completion.	A Wellbore Completion contains one or more Well Path Facets.	Each Reservoir Preparation usually results in one Wellbore Completion, although the interval may not be the same.
	Wellhead Stream	Wellhead Stream measurements may or may not correspond to a Geologic Facet.	In a single completion, volumes measured at the wellhead may correspond with a Well Path.	The effectiveness of each Reservoir Preparation is measured at the Wellhead Stream.
	Well Reporting Stream	Well Reporting Stream may correspond to a Geologic Facet, if needed.	Volumes may be allocated to a Well Path if needed.	The effectiveness of each Reservoir Preparation can be determined by calculation.

Mechanical Interface	Mechanical Conveyance	Obligation	Outcome
Each Well Set may contain one or more Mechanical Interfaces.	Each Well Set may contain one or more Mechanical Conveyances.	Each Well Set may be subject to one or more Obligations.	Each Well Set may have one or more Outcomes.
Each Well may contain one or more Mechanical Interfaces.	Each Well may contain one or more Mechanical Conveyances.	Each Well may be subject to one or more Obligations.	Each Well may have one or more Outcomes.
Installation of a Mechanical Interface is usually conducted through the Well Origin.	Installation of a Mechanical Conveyance is usually conducted through the Well Origin.	Obligations may be defined by Well Origin.	Outcomes may be aggregated to the Well Origin for maps or reports.
Each Mechanical Interface is contained by a Wellbore.	Each Mechanical Conveyance is contained by a Wellbore.	Obligations may be defined by Wellbore.	Outcomes may be aggregated to a Wellbore for maps or reports.
Wellbore Segment does not usually correspond with the Mechanical Interface interval.	Wellbore Segment does not usually correspond with the Mechanical Conveyance interval.	Obligations may be defined by Wellbore Segment.	Outcomes are rarely aggregated to this level.
A Mechanical Interface connects one or more Wellbore Contact Intervals to act as a unit.	A Mechanical Conveyance transmits fluids from one or more Wellbore Contact Intervals.	Obligations may be defined by the Wellbore Contact Interval.	Outcomes may be aggregated to a Wellbore Contact Interval for performance or reserves calculations.
A Wellbore Completion that spans more than one Wellbore will have one Mechanical Interface for each Wellbore included.	A Mechanical Conveyance transmits fluids to or from one Wellbore Completion.	Obligations may be defined by the Wellbore Completion, particularly those related to production volumes.	Outcomes may be related to a Wellbore Completion for performance assessment or reserves calculations.
The effectiveness of each Mechanical Interface is measured at the Wellhead Stream.	A single Mechanical Conveyance may be related to a single Wellhead Stream.	Obligations may be defined by the Wellhead Stream.	Well performance may be analyzed at the Wellhead Stream level.
The effectiveness of each Mechanical Interface can be determined by calculation.	Production volumes may be determined for each Mechanical Conveyance.	Obligations may be defined by the Wellbore Contact Interval.	Well performance can be analyzed at any level needed.

Role	Geologic	Well Path	Reservoir Preparation	Mechanical Interface	Mechanical Conveyance	Obligation
Accounts Payable	I	I	I	I	I	R
Completion Engineer	I	C	R	R	C	C
Drilling Engineer	C	R	C	C	C	C
Economist / Investor / Accounting & Financial	C	C	I	I	I	C
Executive	A	A	A	A	A	A
Facilities Engineer		I	C	I	C	
Field Operator				I	I	C
Geoscientist	R	C	C			C
HSE Field Inspector			I	I	I	I
Joint Venture Management	C	C	I	I	I	C
Land Management	C	C	I	I		R
Land Owner	I	C	C			I
Production Accountant			I		I	R
Production Engineer	I	I	C	C	R	C
Reservoir Engineer	C	C	R	C		I
Government	I	I	I	I	I	A
Regulator	I	C	C	C	I	R
Regulatory Filing	I	I	I	I	I	R

Responsible **Accountable** **Consulted** **Informed**

Outcome	Description
I	Prepare, track, process, and reconcile financial transactions of AFE's, internal and external costs, and other financial obligations for the physical completion activities.
C	Design the interface to expose and prepare the zone for production or injection or for monitoring the well. Hand over to production engineer for routine operations.
C	Design and build the wellbore until the completion engineer role starts (usually drilled to TD and cased). Often handles sign off for certain processes or reports. Responsible for where the bit is going.
C	Analyze and predict the financial impact of operations on corporate strategies and income; identify opportunities and risks; recommend acquisition and disposal.
A	Establish corporate goals and accountability; develop strategies to achieve the goals; allocate fiscal and human resources.
I	Design and build the surface facilities to control, gather, collect, monitor, measure, process and distribute commodities to and from the well to the point of sale or disposal.
C	Operate and maintain well site and surface production equipment and related facilities at the well site in compliance with the engineering plan and regulations.
C	Create a 3D model of the earth to discover and evaluate oil and gas accumulations; recommend drilling targets; advise on well trajectory; manage geologic risk; probabilistic model of reserves. Ensure the drilling is in the payzone.
I	Ensure compliance with applicable regulations or corporate safety standards. Typically an inspector works for the regulator or the operator.
C	Administer and interpret agreements with other companies pertaining to wells and facilities.
I	Establish and interpret agreements with governments, landowners, partners for surface and mineral rights; distribute risk to meet corporate goals; maintain leases and contracts; track well ownership; pay mineral rentals; ensure obligations are met.
I	Landowners may own surface rights, usage (such as grazing) rights, mineral rights or any combination of these.
I	Calculate and report volumes produced; calculate gas/oil ratios, water cuts, production rates; pay and receive royalties; ensure regulatory volumetric reporting.
C	Design and build equipment to enable the flow of fluids between the reservoir and the wellhead; periodic maintenance of flow path.
I	Calculate reserve volumes; design and forecast production rates; dynamic reservoir performance (flow over time) and assists with field planning and development.
I	Create and enforce legislation and regulations.
R	Issue permits and orders, monitor, collect and analyze data.
I	Prepare and submit information to the regulator for regulatory compliance; SEC reporting for reserves.

This is a sample of some possible business interactions between roles and the facets. Additional roles may also be found at www.WhatIsACompletion.org.

Thank you to everyone who participated in this *What Is A Completion* work. PPDM standards and best practices are a collaboration, not only globally, but between different industry stakeholders. Thank you for sharing your time and expertise to this effort.

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- **Hasmik Belich**, S&P Global Platts
- **Giovanni Ramos**, Saskatchewan Ministry of the Economy
- **Mary Brown**, Shell
- **Dave Fisher**, PPDM Association
- **Trudy Curtis**, PPDM Association
- **Ingrid Kristel,** PPDM Association

A global perspective was provided by review comments from PPDM members in…

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Together

we can do so much more

Now It's YOUR Turn

Contact **volunteer@ppdm.org** to find out how you can make an impact.

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