Standardisering av geografisk informasjon
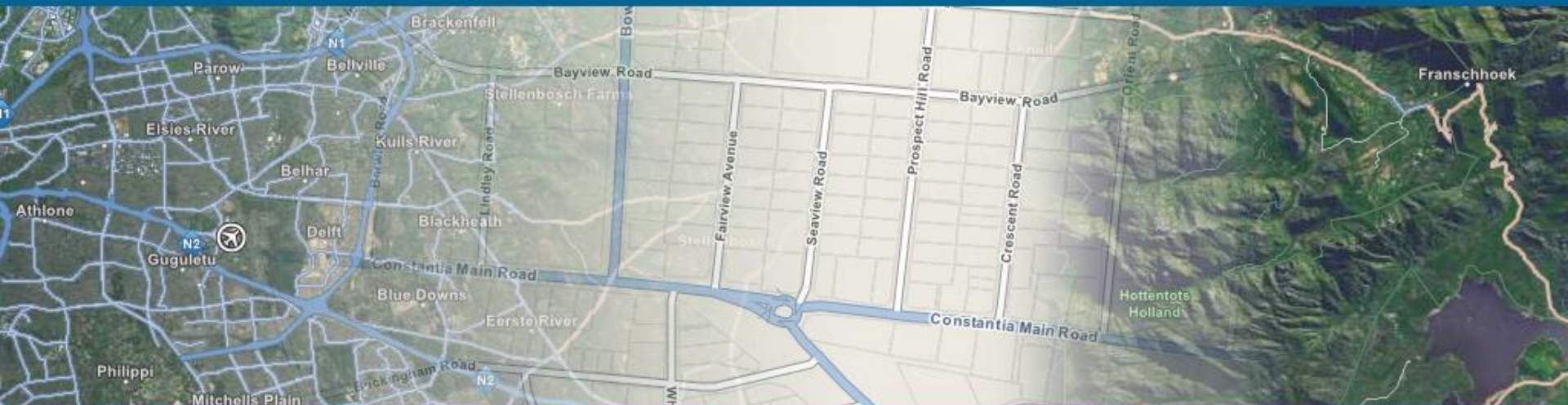
Sverre Stikbakke

STANDARDISERINGSARENAER

- Norge
  - Kartverket startet utviklingen av SOSI-formatet på 80-90 -tallet

- Internasjonalt
  - ISO TC211
  - OGC

ISO/TC 211
GEOGRAPHIC INFORMATION/GEOMATICS
2015-06

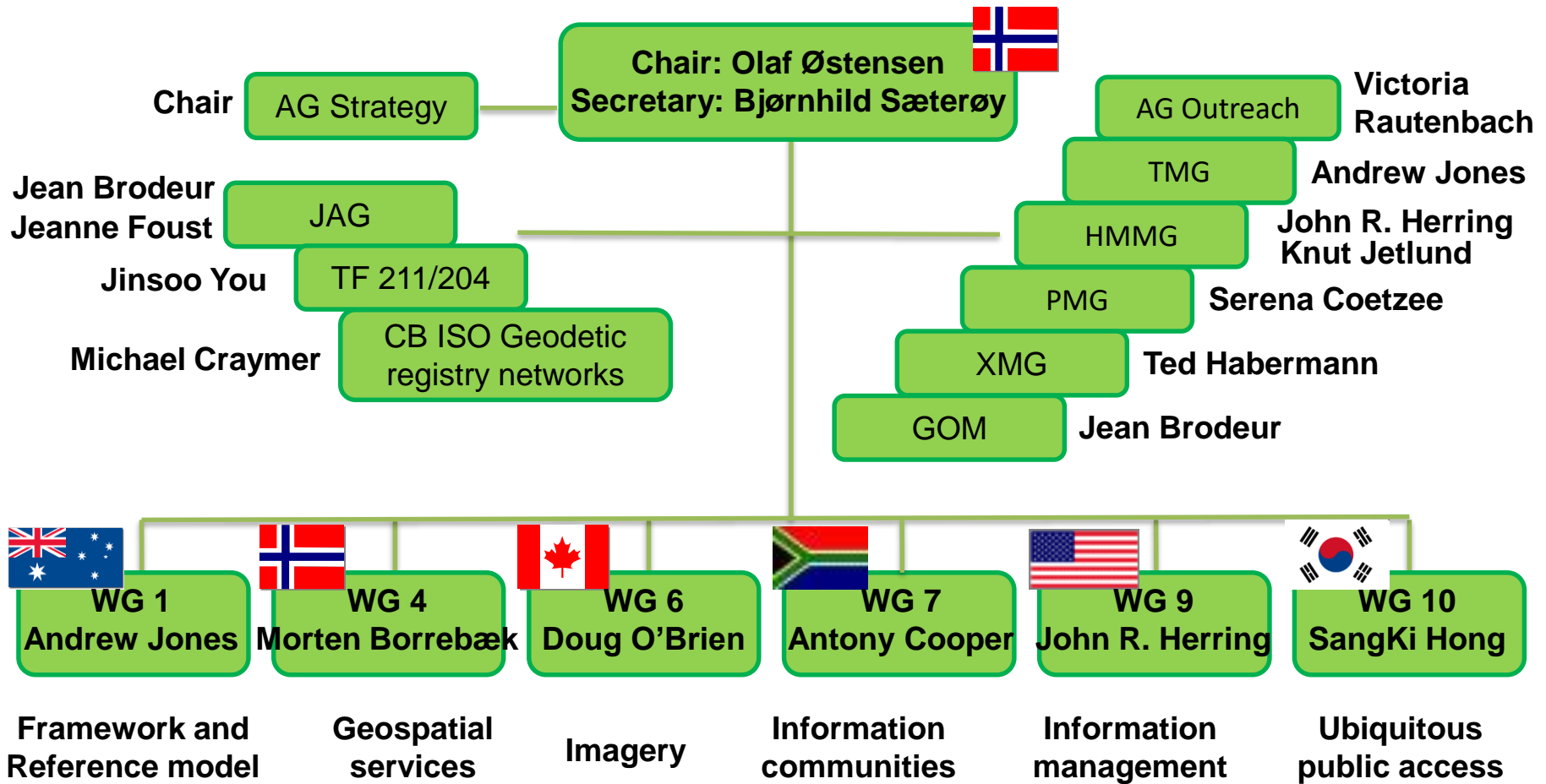*…building the foundation of the geospatial infrastructure, brick by brick …*

The goal of ISO/TC 211...

… is to develop a family of international standards that will
- support the understanding and usage of geographic information
- increase the availability, access, integration, and sharing of geographic information, enable inter-operability of geospatially enabled computer systems
- contribute to a unified approach to addressing global ecological and humanitarian problems
- ease the establishment of geospatial infrastructures on local, regional and global level
- contribute to sustainable development

Scope of ISO/TC 211

- Standardization in the field of digital geographic information.

- This work aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth.

- These standards may specify, for geographic information, methods, tools and services for data management (including definition and description), acquiring, processing, analyzing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations.

- This work shall link to appropriate standards for information technology and data where possible, and provide a framework for the development of sector-specific applications using geographic data.

ISO/TC 211 organization

Chair: Olaf Østensen
Secretary: Bjørnhild Sæterøy

Chair — AG Strategy

AG Outreach — **Victoria Rautenbach**

TMG — **Andrew Jones**

Jean Brodeur
Jeanne Foust — JAG

HMMG — **John R. Herring**
Knut Jetlund

Jinsoo You — TF 211/204

PMG — **Serena Coetzee**

CB ISO Geodetic registry networks

Michael Craymer

XMG — **Ted Habermann**

GOM — **Jean Brodeur**

WG 1
Andrew Jones

WG 4
Morten Borrebæk

WG 6
Doug O'Brien

WG 7
Antony Cooper

WG 9
John R. Herring

WG 10
SangKi Hong

Framework and Reference model

Geospatial services

Imagery

Information communities

Information management

Ubiquitous public access

Who are we ? ...member list

Active members (P-members), 34 countries

Australia	Hungary	Russian Federation
Austria	India	Saudi Arabia
Belgium	Iran	Serbia
Botswana	Italy	South Africa
Canada	Japan	Spain
Chile	Rep. of Korea	Sweden
China	Lithuania	Switzerland
Czech Republic	Malaysia	Thailand
Denmark	Netherlands	United Kingdom
Finland	New Zealand	United States of America
France	Norway	
Germany	Peru	

Who are we ? ...member list

Observing members (P-members), 30 countries

Argentina	Hong Kong	Philippines
Azerbaijan	Iceland	Poland
Bahrain	Indonesia	Romania
Brunei Darussalam	Ireland	Slovakia
Colombia	Israel	Slovenia
Croatia	Kenya	Swaziland
Cuba	Mauritius	Tanzania
Cyprus	Morocco	Turkey
Estonia	Oman	Ukraine
Greece	Pakistan	Uruguay

ISO/TC 211 Publications (1)

- **ISO 6709:2008 – Standard representation of geographic point location by coordinates**
- **ISO 19101-1:2014 – Reference model – Part 1: Findamentals**
- **ISO 19101-2:2008 – Reference model – Part 2: Imagery**
- **ISO/TS 19103:2005 – Conceptual schema language** (under revision)
- **ISO/TS 19104:2008 – Terminology** (under revision)
- **ISO 19105:2000 – Conformance and testing**
- **ISO 19106:2004 – Profiles**
- **ISO 19107:2003 – Spatial schema** (under revision)
- **ISO 19108:2002 – Temporal schema**
- **ISO 19109:2005 – Rules for application schema** (under revision)
- **ISO 19110:2005 – Feature cataloguing methodology** (under revision)
- **ISO 19111:2007 – Spatial referencing by coordinates**
- **ISO 19111-2:2009 – Spatial referencing by coordinates – Part 2: Extension for parametric values**
- **ISO 19112:2003 – Spatial referencing by geographic identifiers**
- **ISO 19115-1:2014 – Metadata – Part 1: Fundamentals**
- **ISO 19115-2:2008 – Metadata – Part 2: Extensions for imagery and gridded data** (under revision)
- **ISO 19116:2004 – Positioning services**
- **ISO 19117:2012 – Portrayal**
- **ISO 19118:2011 – Encoding**
- **ISO 19119:2005 – Services** (under revision)

ISO/TC 211 Publications (2)

- **ISO/TR 19120:2001 – Functional standards**
- **ISO/TR 19121:2000 – Imagery and gridded data**
- **ISO/TR 19122:2004 – Qualification and certification of personnel**
- **ISO 19123:2005 – Schema for coverage geometry and functions**
- **ISO 19125-1:2004 – Simple feature access – Part 1: Common architecture**
- **ISO 19125-2:2004 – Simple feature access – Part 2: SQL Option**
- **ISO 19126:2009 – Feature concept dictionaries and registers**
- **ISO/TS 19127:2005 – Geodetic codes and parameters** (under revision)
- **ISO 19128:2005 – Web Map Server Interface**
- **ISO/TS 19129:2009 – Imagery, gridded and coverage data framework**
- **ISO/TS 19130:2010 – Imagery sensor models for geopositioining** (under revision)
- **ISO/TS 19130-2:2014 – Imagery sensor models for geopositioining – Part 2: SAR, InSAR, lidar and sonar**
- **ISO 19131:2007 – Data product specification**
- **ISO 19132:2007 – Location-based services – Reference model**
- **ISO 19133:2005 – Location-based services – Tracking and navigation**
- **ISO 19134:2007 – Location-based services – Multimodal routing and navigation**
- **ISO 19135:2005 – Procedures for item registration** (under revision)
- **ISO/TS 19135-2:2012 – Procedures for item registration -- Part 2: XML schema implementation**
- **ISO 19136:2007 – Geography Markup Language (GML)**
- **ISO 19137:2007 – Core profile of the spatial schema**
- **ISO/TS 19139:2007 – Metadata – XML schema implementation** (under revision)
- **ISO/TS 19139-2: 2012 – Metadata – XML schema implementation – Part 2: Extensions for imagery and gridded data**

ISO/TC 211 Projects (1)

Colour legend: DIS, FDIS

- ISO 19103 – Conceptual schema language (rev of ISO/TS 19103:2005)
- ISO 19104 – Terminology (rev of ISO/TS 19104:2008)
- ISO 19107 – Spatial schema (rev of ISO 19107:2003)
- ISO 19109 – Rules for application schema (rev of ISO 19109:2005) (→IS)
- ISO 19110 – Methodology for feature cataloguing (rev of ISO 19110:2005) (→IS)
- ISO 19115-2 – Metadata - Part 2: Extensions for imagery and gridded data (rev of ISO 19115-2:2009)
- ISO 19115-3 – Metadata - Part 3: XML schema implementation of metadata fundamentals
- ISO 19119 – Services (rev of ISO 19119:2005)
- ISO 19127 – Geodetic codes and parameters (rev of ISO/TS 19127:2005)
- ISO/TS 19130-1 – Imagery sensor models for geopositioining (rev of ISO/TS 19130:2010)
- ISO 19135-1 – Procedures for item registration - Part 1: Fundamentals (rev of ISO 19135:2005) (→IS)
- ISO 19136-2 – Geography Markup Language (GML) - Part 2: Extended schemas and encoding rules (→IS)
- ISO/TS 19139-1 – Metadata – XML schema implementation (rev of ISO/TS 19139:2007)

WG 9 – Information management

WG 9
John R. Herring
USA

- ISO 19107 – Spatial schema (revision of ISO 19107:2003)
- ISO 19109 – Rules for application schema (revision of ISO 19109:2005)
- ISO 19135-1 – Procedures for item registration – Part 1: Fundamentals (revision of ISO 19135:2005)
- ISO/TS 19157-2 – Data Quality – Part 2: XML schema implementation of ISO 19157
- ISO 19162 – Well known text representation of coordinate reference systems

- Foregående lysbilder er hentet fra:
- ISO/TC 211 Presentations - June 2015, 25 slides (www.isotc211.org)

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Standardisering

ISO-TC211

Referansemodell

Terminologi

Spatial Schema

Simple Features

...

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Grunnleggende standarder (utvalgte)

- - ISO19101 Referansemodeller
- - ISO19103 Beskrivelsesspråk (Conceptual schema language)
- - ISO 19104 Terminologi
- - ISO 19107 Spatial Schema
- - ISO 19111 Spatial referencing by coordinates
- - ISO 19112 Spatial referencing by geographic identifiers

Standarder for Anvendelser (UTVALGTE)

- - ISO 19115 Metadata
- - ISO 19125 Simple Features Access
- - ISO 19128 Web Map Service Interface (WMS)
- - ISO 19136 Geography Markup Language (GML)

Myndighetsdrevet standardisering

Utviklerdrevet standardisering

OGC (Open Geospatial Consortium)

- "The OGC (Open Geospatial Consortium) is an international not for profit organization committed to making quality open standards for the global geospatial community. These standards are made through a consensus process and are freely available for anyone to use to improve sharing of the world's geospatial data."

- www.opengeospatial.org

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Medlemmer

Organization	Level	Region
Airbus Defence & Space	Principal	Europe
BAE Systems - C3I Systems	Principal	North America
Bentley Systems, Inc.	Principal	North America
Department of Science & Technology	Principal	Asia Pacific
DigitalGlobe, Inc.	Principal	North America
Esri	Principal	North America
Feng Chia University	Principal	Asia Pacific
GeoConnections - Natural Resources Canada	Principal	North America
GIS Center for Security	Principal	Middle East
Google	Principal	North America
Intergraph Corporation	Principal	North America
Lockheed Martin	Principal	North America
Oracle USA	Principal	North America
Pitney Bowes Software	Principal	North America
Pixia Corporation	Principal	North America
Trimble Navigation Ltd.	Principal	North America
United Nations Geographic Information Working Group (UNGIWG)	Principal	Europe
US National Oceanic and Atmospheric Administration (NOAA)	Principal	North America

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Medlemskategorier

Strategic (5)
Principal (18)
Technical (73)

Technical
Aggregate (1)
Associate (126)
Small Company (44)

GovFuture-
Subnational (20)
NGO / Not For Profit
Institute (57)
GovFuture-Local (33)

University (110)
Individual (32)

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FRA OGC til ISO

OGC-spesifikasjon → bearbeiding av ISO → ISO-standard
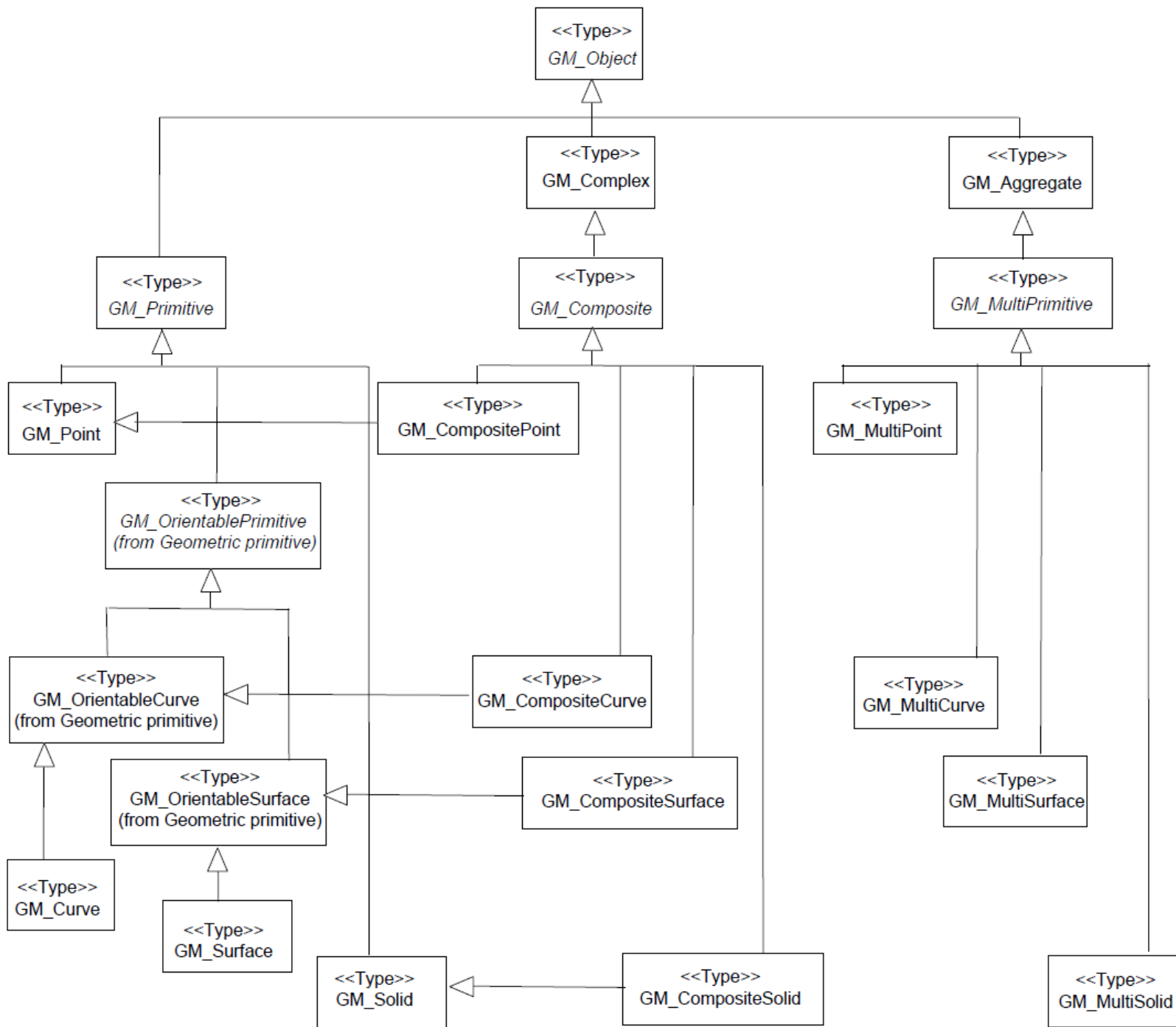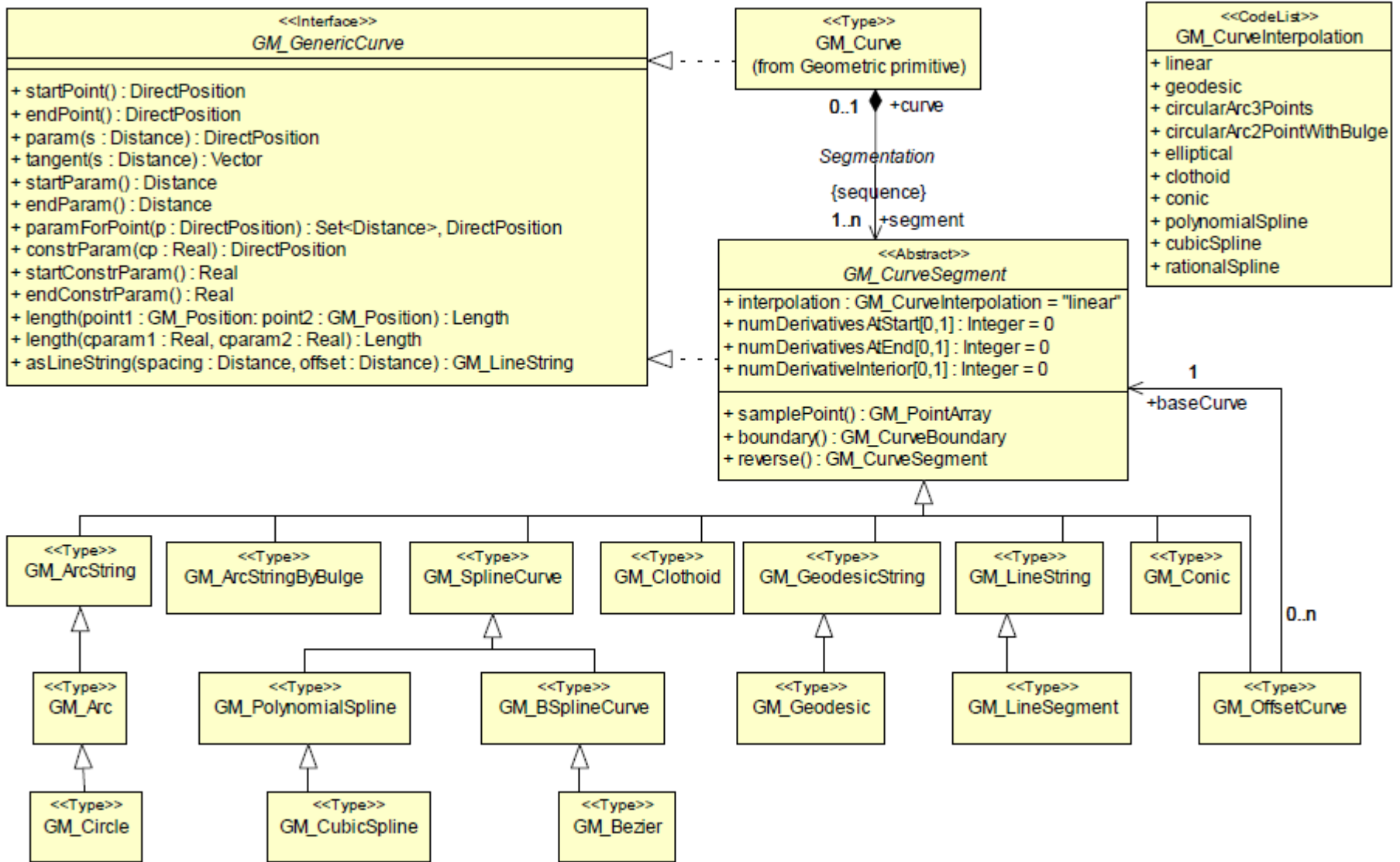
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To standarder med ulikt fokus

- ISO 19107 Spatial Schema:
- Spatial schema is an abstract and non-platform dependent specification

- ISO 19125 Simple Features Access:
- SFA-CA is an implementation and platform dependent specification

ISO 19107 Spatial Schema

- Hoveddeler:
- - Geometry packages
- - Topology packages
- Disse pakke-settene beskrives uavhengig av hverandre.

<<Interface>>
GM_GenericCurve

+ startPoint() : DirectPosition
+ endPoint() : DirectPosition
+ param(s : Distance) : DirectPosition
+ tangent(s : Distance) : Vector
+ startParam() : Distance
+ endParam() : Distance
+ paramForPoint(p : DirectPosition) : Set<Distance>, DirectPosition
+ constrParam(cp : Real) : DirectPosition
+ startConstrParam() : Real
+ endConstrParam() : Real
+ length(point1 : GM_Position: point2 : GM_Position) : Length
+ length(cparam1 : Real, cparam2 : Real) : Length
+ asLineString(spacing : Distance, offset : Distance) : GM_LineString

<<Type>>
GM_Curve
(from Geometric primitive)

0..1 +curve

Segmentation

{sequence}

1..n +segment

<<CodeList>>
GM_CurveInterpolation

+ linear
+ geodesic
+ circularArc3Points
+ circularArc2PointWithBulge
+ elliptical
+ clothoid
+ conic
+ polynomialSpline
+ cubicSpline
+ rationalSpline

<<Abstract>>
GM_CurveSegment

+ interpolation : GM_CurveInterpolation = "linear"
+ numDerivativesAtStart[0,1] : Integer = 0
+ numDerivativesAtEnd[0,1] : Integer = 0
+ numDerivativeInterior[0,1] : Integer = 0

+ samplePoint() : GM_PointArray
+ boundary() : GM_CurveBoundary
+ reverse() : GM_CurveSegment

1 +baseCurve

0..n

<<Type>>
GM_ArcString

<<Type>>
GM_ArcStringByBulge

<<Type>>
GM_SplineCurve

<<Type>>
GM_Clothoid

<<Type>>
GM_GeodesicString

<<Type>>
GM_LineString

<<Type>>
GM_Conic

<<Type>>
GM_Arc

<<Type>>
GM_PolynomialSpline

<<Type>>
GM_BSplineCurve

<<Type>>
GM_Geodesic

<<Type>>
GM_LineSegment

<<Type>>
GM_OffsetCurve

<<Type>>
GM_Circle

<<Type>>
GM_CubicSpline

<<Type>>
GM_Bezier

Figuren på foregående side viser de forskjellige klassene som kan brukes for å definere linje-objekter. Noen av dem er:

GM_LineSegment
GM_ArcString
GM_Arc
GM_Circle
GM_ArcByBulge
GM_Clothoid
GM_CubicSpline
GM_Bezier

Eksempel: GM_ArcString

"A GM_ArcString (Figure 17) is similar to a GM_LineString except that the interpolation is by circular arcs.
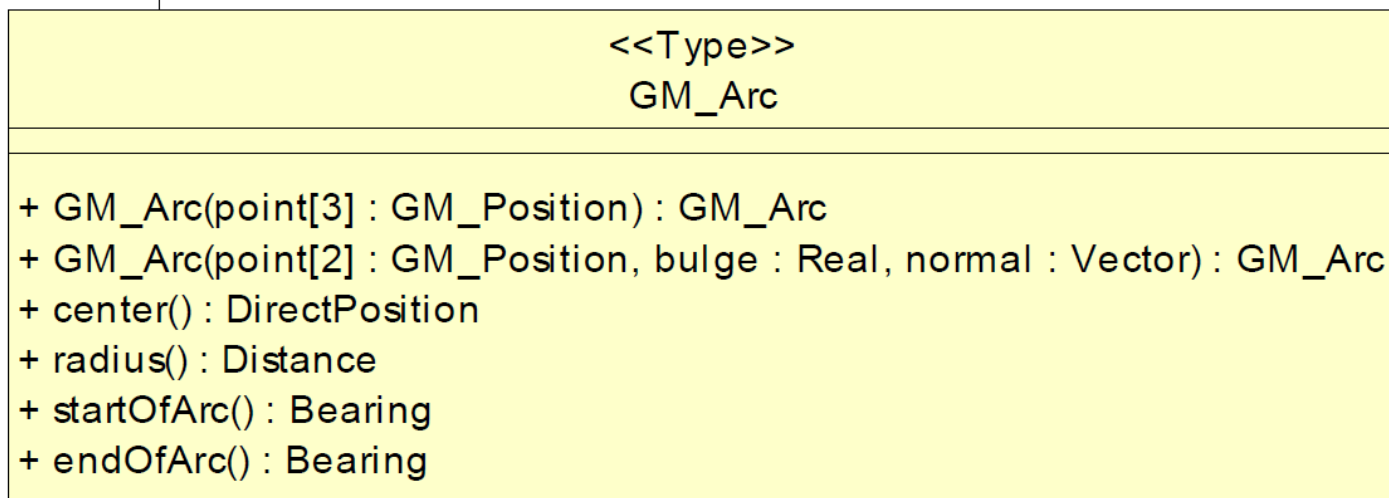
Since it requires 3 points to determine a circular arc, the controlPoints are treated as a sequence of overlapping sets of 3 GM_Positions, the start of each arc, some point between the start and end, and the end of each arc.
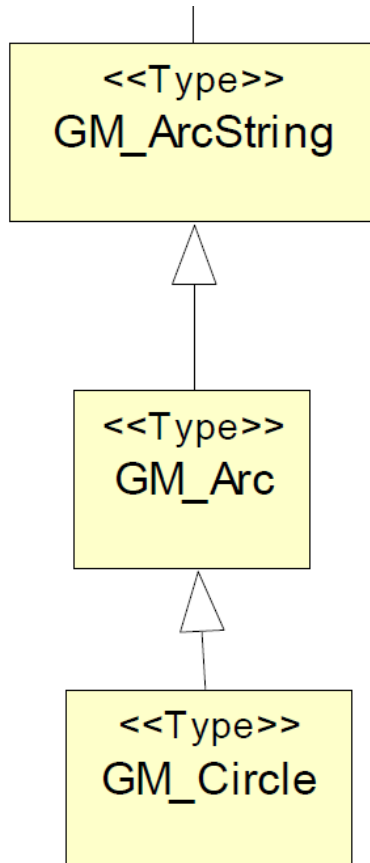
Since the end of each arc is the start of the next, this GM_Position is not repeated in the controlPoint sequence."

GM_Arc er en underklasse av GM_ArcString. GM_Arc er ett enkelt buesegment, mens GM_ArcString kan være flere sammenhengende buesegmenter, hvert med potensielt forskjellig radius, f.eks.

"A GM_Arc is defined by 3 points, and consists of the arc of the circle determined by the 3 points, starting at the first, passing through the second and terminating at the third.

If the 3 points are co-linear, then the arc shall be a 3-point line string, and will not be able to return values for center, radius, start angle and end angle."

```
                    <<Type>>
                    GM_Arc

+ GM_Arc(point[3] : GM_Position) : GM_Arc
+ GM_Arc(point[2] : GM_Position, bulge : Real, normal : Vector) : GM_Arc
+ center() : DirectPosition
+ radius() : Distance
+ startOfArc() : Bearing
+ endOfArc() : Bearing
```

<<Type>>
GM_ArcString

<<Type>>
GM_Arc

<<Type>>
GM_Circle

GM_Circle
Same as GM_Arc, but closed to form a full circle. The "start" and "end" bearing are equal and shall be the bearing for the first controlPoint listed.

Oppsummert

- Standarden definerer en rekke klasser som kan brukes for å definere ulike type geometrier. Geometriene kan være i 0D, 1D, 2D og 3D.

- Standarden definerer på en presis måte hvilke parametre som beskriver geometriene, f.eks. at det trengs 3 sett med koordinater for å beskrive en GM_Arc.

Topology packages

- På samme måte som det finnes klasser som beskriver geometri finnes det i standarden også klasser som beskriver topologi.