Temporal Filter Support

Scratchpad to discuss implementing temporal filter support in GeoTools.

Motivation

The WFS 2.0 / FES 2.0 specs add support for temporal filter operators for which we don't have any way of representing in geotools.

How does WFS 2.0 / FES 2.0 compare to the CQL standard for representing temporal filters? The words look the same; I expect they are just bringing the capabilities up to par.

Temporal Filter Operators

The following are the list of temporal operators defined by the FES spec. Operations take a mix of two types of operands:

1. A single instance in time (TM_Instant)
2. A time range or period (TM_Period)

Operation	t1,t2	t1[],t2	t1,t2[]	t1[],t2[]
After	t1 > t2	t1.start > t2	t1 > t2.end	t1.start > t2.end
Before	t1 < t2	t1.end < t2	t1 < t2.start	t1.end < t2.start
Begins			t1 = t2.start	t1.start = t2.start and t1.end < t2.end
BegunBy		t1.start = t2		t1.start = t2.start and t1.end > t2.end
TContains		t1.start < t2 < t1.end		t1.start < t2.start and t2.end < t1.end
During			t2.start < t1 < t2.end	t1.start > t2.start and t1.end < t2.end
EndedBy		t1.end = t2		t1.start < t2.start and t1.end = t2.end
Ends			t1 = t2.end	t1.start > t2.start and t1.end = t2.end
TEquals	t1 = t2			t1.start = t2.start and t1.end = t2.end
Meets				t1.end = t2.start

MetBy				t1.start = t2.end
TOverlaps				t1.start < t2.start and t1.end > t2.start and t1.end < t2.end
OverlappedBy				t1.start > t2.start and t1.start < t2.end and t1.end > t2.end
AnyInteracts				

Current GeoTools Temporal Support

The `gt-opengis` model defines the `org.opengis.temporal` package which contains a variety of interfaces describing temporal objects which correspond to TM_Instant and TM_Period. The `gt-temporal` module contains implementations of them.

Feature Model

How to represent time in our feature model. A single time instant is simple enough, we can represent it with a single `java.util.Date`. However representing a time period gets more tricky since it is a complex object and really falls into the realm of app-schema. The question is do we want to limit support for filtering based on period to app-schema? Or do we want to come up with a "simple" convention that can be applied to simple/flat features.