FDSN Source Identifiers

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FDSN

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CONTENTS

This specification defines the construction of unique identifiers for data sources exchanged and archived in formats and services defined by the International Federation of Digital Seismograph Networks (FDSN) and related services and formats.

The FDSN defines, allocates and adopts a number of codes that, when combined in a hierarchy, uniquely identify a data source at a given time. The identifer is constructed by combining *network*, *station*, *location* and *channel* codes, where the channel code is further subdivided into *band*, *source* and *subsource* codes.

This specification defines the meaning and rules for these codes in addition to how they are to be combined into a URI-like pattern as follows:

```
FDSN:<network>_<station>_<location>_<band>_<source>_<subsource>
```

This single-string identifier uniquely identifies a source in FDSN formats and services.

CHAPTER

ONE

DEFINITION OF IDENTIFIERS

Data sources are uniquely identified using a sequence of codes named **network**, **station**, **location** and **channel**, where the channel is further subdivided into **band**, **source** and **subsource** codes. Each of these codes must be composed of the following ASCII character sets:

- Uppercase [A-Z], ASCII 65 through 90
- Numeric [0-9], ASCII 48 through 57

The station and location codes may further be composed of the following ASCII character:

- Dash "-", ASCII 45

The codes are further defined as follows:

> **Network code**: Uniquely identifies the owner and network operator responsible for the data. Network codes are assigned by the FDSN. Must be between 1 and 8 characters. Further description of *Network codes*.
>
> **Station code**: Uniquely identifies a station within a network. Station codes may be registered with the International Registry of Seismograph Stations. Must be between 1 and 8 characters. Otherwise, these may be whatever the operator wishes.
>
> **Location code**: Uniquely identifies a group of channels within a station, for example from a specific sensor or sub-processor. Must not exceed 8 characters. The special value of "–" (two dashes) is forbidden as it conflicts with previous usage for designating empty locations. Further description of *Location codes*.

Channel: A sequence of codes that identify the band, source and subsource. Definition and values for each of these codes are in *Channel codes*.

> **Band**: Indicates the sampling rate range and response band of the data source.
>
> **Source**: Identifies an instrument or other data source.
>
> **Subsource**: Identifies a sub-category within the source.

1.1 Source Identifiers

The FDSN Source Identifier (SID) is a combination of the network, station, location, band, source and subsource codes into a Uniform Resource Identifier (URI). The pattern of the Source Identifier is as follows:

For identifying a data source, i.e. a specific channel:

```
FDSN:<network>_<station>_<location>_<band>_<source>_<subsource>
```

where the *network*, *station* and *source* codes are required to be non-empty. The underscore (ASCII 95) delimiters must always be present.

Abbreviations of the fully qualified identifer may also be used to identify higher hierarchical levels such as a *location* (a collection of specific channels within a station), a *station* within a network, and a *network* as follows:

```
FDSN:<network>_<station>_<location>
FDSN:<network>_<station>
FDSN:<network>
```

Example identifiers:

```
FDSN:IU_COLA_00_B_H_Z
```

where network=IU, station=COLA, location=00 and channel=B_H_Z

```
FDSN:NL_HGN__L_H_Z
```

where network=NL, station=HGN, location is empty and channel=L_H_Z

The `FDSN:` portion is a namespace identifier reserved to identify this specification.

1.2 Mapping of SEED 2.4 codes

In the SEED 2.4 standard, data sources are identified by a combination of network, station, location and channel codes, abbreviated here as a *NSLC*. A NSLC can always be mapped to a Source Identifier. Conversely, so long as each code is within the length restrictions imposed by SEED 2.4, Source Identifiers can be also be mapped back to SEED 2.4 codes. The mapping is as follows:

1.2.1 From SEED NSLC to Source Identifier

Network codes

The 1 to 2 character network code is mapped without change.

For temporary networks, starting with X, Y, Z or 0-9, the 2 character network code may be mapped either unchanged, or may follow the *Transitional mapping of previously allocated temporary network codes* by appending the start year to create a 6 character code, when the 6-character code has been allocated by the FDSN.

Station codes

The 1 to 5 character station code is mapped without change.

Location codes

The 0 to 2 character location code is mapped without change.

Channel codes

The 3-character channel codes are split into the three single character *band*, *instrument* and *orientation* codes, which are mapped to the Source Identifier (*Channel codes*) *band*, *source* and *subsource* codes.

Examples

Permanent network NSLC: 'IU', 'ANMO', '00', 'BHZ' maps to `FDSN:IU_ANMO_00_B_H_Z`

Permanent network NSLC: 'IU', 'ANMO', '', 'BHZ' maps to `FDSN:IU_ANMO__B_H_Z`

Temporary network starting in 2002 NSLC: 'XA', 'ABCD', '00', 'BHZ' maps to `FDSN:XA_ABCD_00_B_H_Z` or to `FDSN:XA2002_ABCD_00_B_H_Z`

1.2.2 From Source Identifier to SEED NSLC

Network codes

Codes from 1 and 2 characters are mapped without change. Network codes following the 6-character *Transitional mapping of previously allocated temporary network codes* are mapped using just the first 2 characters of the code, removing the 4 character year. Otherwise, there is no mapping for network codes greater than 2 characters.

Station codes

Codes from 1 to 5 characters are mapped without change. There is no mapping for stations codes greater than 5 characters.

Locations codes

Codes from 0 and 2 characters are mapped without change. There is no mapping for location codes greater than 2 characters.

Channels codes

Code combinations where the Source Identifier (*Channel codes*) *band*, *source* and *subsource* codes are all 1 character each, are concatenated in this order and mapped to the 3 character NSLC channel codes. Otherwise, there is no mapping when individual codes are greater than 2 characters.

Examples

Permanent network `FDSN:IU_ANMO_00_B_H_Z` maps to NSLC: 'IU', 'ANMO', '00', 'BHZ'

Permanent network `FDSN:IU_ANMO__B_H_Z` maps to NSLC: 'IU', 'ANMO', '', 'BHZ'

Temporary network starting in 2002 `FDSN:XA_ABCD_00_B_H_Z` maps to NSLC: 'XA', 'ABCD', '00', 'BHZ'

Temporary network starting in 2002 `FDSN:XA2002_ABCD_00_B_H_Z` maps to NSLC: 'XA', 'ABCD', '00', 'BHZ'

CHAPTER TWO

NETWORK CODES

Network codes are assigned by the FDSN to uniquely identify the owner and operator responsible for the data collected by a network. Network operators may request a network code as needed for new deployments.

2.1 Temporary network code convention

Network codes for deployments that are known to be temporary are strongly encouraged to include the 4-digit start year of the deployment at the end of the code with the following pattern:

```
<1-4 characters><4-digit start year>
```

For example, `SEIS2018` would be a valid network code and imply that the initial deployment was in the year 2018 and is temporary.

2.1.1 Transitional mapping of previously allocated temporary network codes

Historical temporary network codes were allocated as two-character codes, with the first character being a digit (0-9) or the letters X, Y or Z. Many of these codes have been reused for different deployments in different years and are therefore not globally unique. A data owner or delegate data center may wish to convert, or provide an alias, for data using the older, 2-character codes. The mapping from the 2-character codes is strongly recommended to follow this pattern:

```
<2-character code><4-digit start year>
```

where the initial character is a digit (`0-9`) or the letters `X`, `Y` or `Z`.

For example, a network deployment allocated a network code of `XA` operating in the years 2002 and 2003 could be mapped to `XA2002`.

A temporary network operator may wish to request a 6 character network code in the transitional mapping pattern above in order have a globally unique code that is also usable with miniSEED 2 through the mapping. Furthermore, the FDSN reserves all 6 character network codes that match the transitional mapping pattern for all previously or future allocated 2 character temporary network codes. Thus the code XA2002 must be assigned solely to the temporary network with code XA that was operating in 2002.

2.2 Special network codes

Two network codes are reserved for special cases:

- `SS` – This code may be used by any institution running a Single Station, the station should be registered with the International Registry of Seismograph Stations. Care must be taken to ensure that the station code is not the same as another station using the SS network code.
- `XX` – This code is not real. It is reserved for test data, examples or transient usage when a real code cannot be used. Data with this network code should never be distributed.

CHAPTER

THREE

LOCATION CODES

Location codes are used to logically group channels within a single station deployment. This can be for channels produced by the same sensor, channels produced in a sub-processor, many sensors deployed in a grid or an array, etc.

When used to designate sensors deployed in an array, operators may choose to identify a series of sensors using ordered or otherwise meaningful location code values.

The use and meaning of the location code is generally up to the defining network. However the following guidelines are recommended for consistency across networks:

1. Channels that are closely related should have the same location code, e.g. channels from the same instrument that differ only in orientation or sampling rate, like `B_H_Z` and `B_H_E` or `B_H_Z` and `S_H_Z`, should have the same location code.
2. Sharing a single location code does not necessarily imply the channels come from the same instrument, e.g. the primary seismometer and primary accelerometer might both have location code `00` even if they are physically separate instruments.
3. The primary seismic channels at traditional seismic stations should have location code of `00` or be empty.
4. Use of an empty location code is recommended only for stations that do not have multiple instruments of the same type and have traditionally not used location codes.
5. Sensors in an array within a station may be logically grouped in a regular, systematic scheme, e.g. incrementing numbers for a linear array, or using two identifiers separated by a dash for a 2D grid.
6. Alpha-numeric ordering should be considered desirable, e.g. using `01` to `10` instead of `1` to `10` for a linear array.
7. Otherwise the network may use the location code for any meaningful system of organizing and namespacing channels at a station.

CHAPTER

FOUR

CHANNEL CODES

4.1 Band, source and subsource codes

A *channel* is composed of a sequence of three codes that each describe an aspect of the instrumentation and its digitization as follows:

> **Band**: Indicates the general sampling rate and response band of the data source. May be empty for non-time series data.
>
> **Source**: Identifies an instrument or other general data source. Cannot be empty.
>
> **Subsource**: Identifies a sub-category within the source, often the orientation, relative positon, or sensor type. The meaning of subsource codes are specific to the containing source. May be empty.

A *channel* is the combination of these three codes separated by "_" (ASCII 95) in the following pattern: `Band_Source_Subsource`, which forms the end of a source identifier.

For usage of Band codes **A** and **O** (both deprecated), the source and subsource codes may be defined by the generator. In these cases, the source and subsource codes should not exceed three characters each in length. In all other cases, source and subsource codes defined in this specification must be used.

Two sequences are reserved for special channels, both deprecated: **L_O_G** for the console log and **S_O_H** for general state of health.

Note: All *channels* with single-character `Band`, `Source`, and `Subsource` codes are equivalent to SEED 2.4 channel designations and vice versa.

4.2 Band Code

The band code specifies the general sampling rate and the approximate response band of the instrument (when applicable to the data source).

Band code	Band type	Sample rate (samples per sec)	Lower bound (sec)
J	...	> 5000	
F	...	>= 1000 to < 5000	>= 10 sec
G	...	>= 1000 to < 5000	< 10 sec
D	...	>= 250 to < 1000	< 10 sec
C	...	>= 250 to < 1000	>= 10 sec
E	Extremely Short Period	>= 80 to < 250	< 10 sec
S	Short Period	>= 10 to < 80	< 10 sec
H	High Broadband	>= 80 to < 250	>= 10 sec
B	Broadband	>= 10 to < 80	>= 10 sec
M	Mid Period	> 1 to < 10	
L	Long Period	~ 1	
V	Very Long Period	>= 0.1 to < 1	
U	Ultra Long Period	>= 0.01 to < 0.1	
W	Ultra-ultra Long Period	>= 0.001 to < 0.01	
R	Extremely Long Period	>= 0.0001 to < 0.001	
P	On order of 0.1 to 1 day	>= 0.00001 to < 0.0001	
T	On order of 1 to 10 days	>= 0.000001 to < 0.00001	
Q	Greater than 10 days	< 0.000001	
I	Irregularly sampled	irregular	
A	Administrative	variable, DEPRECATED	
O	Opaque	variable, DEPRECATED	

4.3 Source and Subsource Codes

The source code specifies the family to which the sensor belongs or otherwise a general data source. In essence, this identifies what is being measured or simulated. Each of these source types are detailed in this section.

The subsource code provides a way to indicate the directionality of the sensor measurement (orientation), the relative location of the sensor or the sensor type. Subsource codes are source-specific.

Geographic orientation subsource codes

Traditional orientation values of North-Source (N), East-West (E), and Vertical (Z) should *only* be used when within 5 degess of true directions. Do not use **N** or **E** designations if the orientation of horizontal components is known to deviate more than 5 degrees from true North/East.

For orthogonal components that are in nontraditional orientations, if the orientation of the horizontal components is known to deviate more than 5 degrees from true North and East, the respective channels should be named **1**, **2** instead of N, E (N->1, E->2).

For sources that record data in a direction typically aligned with geographical coordinate systems, the subsource identifier should follow these conventions (where appropriate):

Subsource codes	Description
N, **E**, **Z**	Traditional orientations of North (N), East (E), and Up (Z) *When within 5 degrees of true directions*
1, **2**, **Z**	Orthogonal components, nontraditional horizontals
1, **2**, **3**	Orthogonal components, nontraditional orientations
T, **R**	For rotated components or beams (Transverse, Radial)
A, **B**, **C**	Triaxial (Along the edges of a cube turned up on a corner)
U, **V**, **W**	Optional components, also used for raw triaxial output

4.3.1 Seismometer

Measures displacement/velocity/acceleration along a line defined by the the dip and azimuth.

Source Code

H	High Gain Seismometer
L	Low Gain Seismometer
M	Mass Position Seismometer
N	Accelerometer
P	Geophone, very short period seismometer with natural frequency 5 - 10 Hz or higher

Subsource Code - See *Geographic orientation codes* for more details.

N, **E**, **Z**	Traditional orientations of North (N), East (E), and Up (Z) *When within 5 degrees of true directions*
1, **2**, **Z**	Orthogonal components, nontraditional horizontals
1, **2**, **3**	Orthogonal components, nontraditional orientations
T, **R**	For rotated components or beams (Transverse, Radial)
A, **B**, **C**	Triaxial (Along the edges of a cube turned up on a corner)
U, **V**, **W**	Optional components, also used for raw triaxial output

Dip/Azimuth: Ground motion vector

Signal Units: `m`, `m/s`, `m/s**2`

4.3.2 Tilt Meter

Measures tilt from the horizontal plane. Azimuth is typically N/S or E/W.

Source Code

A

Subsource Code - See *Geographic orientation codes* for more details.

N, **E**	Traditional orientations of North (N), East (E), and Up (Z) *When within 5 degrees of true directions*
1, **2**	Orthogonal components, nontraditional orientations

Dip/Azimuth: Ground motion vector

Signal Units: `rad` (radian)

4.3.3 Creep Meter

Measures the absolute movement between two sides of a fault. Traditionally this has been done by means of fixing a metal beam on one side of the fault and measuring its position on the other side, but can also done with light beams, triangulation wires and other techniques.

The orientation and therefore the dip and azimuth would be perpendicular to the measuring beam, which would be along the average travel vector for the fault. Position/negative travel would be arbitrary, but would be noted in the dip/azimuth.

Source Code

B

Subsource Code

None defined

Dip/Azimuth: Along the fault or wire vector

Signal Units: `m` (meter)

4.3.4 Calibration Input

Usually only used for seismometers or other magnetic coil instruments. This signal monitors the input signal to the coil to be used in response evaluation. Usually tied to a specific instrument. Sometimes all instruments are calibrated together, sometimes horizontals are calibrated separately from verticals.

Source Code

C

Subsource Code

A, **B**, **C**, **D** - For when there are only a few calibration sources for many devices.

Blank if there is only one calibrator at a time or, match calibrated channel (i.e. **Z**, **N** or **E**).

4.3.5 Pressure

A barometer, microbarometer, or other gauge that measures pressure. Used to measure atmospheric, water, and any other pressure. This includes infrasonic and hydrophone measurements.

Source Code

D

Subsource Code

O	Outside
I	Inside
D	Down hole
F	Infrasound
G	Deep sea differential pressure gauge
H	Hydrophone
U	Underground

Dip/Azimuth: For many pressure measurements Dip and Azimuth are not applicable. If the signal will be used for seismological applications, set Dip to -90 if a positive pressure change gives a positive signal, 90 if a positive pressure change gives a negative signal. This will align polarities with the vertical seismometer channel for UPGOING waves.

Signal Units: `Pa` (Pascal)

4.3.6 Electronic Test Point

Used to monitor circuitry inside recording system, local power or seismometer. Usually for power supply voltages, or line voltages.

Source Code

E

Subsource Code

Designate as desired, make mnemonic as possible, use numbers for test points, etc.

Dip/Azimuth: Not applicable

Signal Units: `V` (Volt), `A` (Ampere), `Hz` (Hertz), etc.

4.3.7 Magnetometer

Measures the magnetic field at the sensor location. They measure the part of the field vector that is aligned with the measurement coil. Many magnetometers are three axis. The instrument will typically be oriented to local magnetic north. The dip and azimuth should describe this in terms of the geographic north.

Example: Assuming magnetic north is 13 degrees east of north at the recording site, if the magnetometer is pointed to magnetic north, the azimuth would be + 103 for the E channel. Some magnetometers do not record any vector quantity associated with the signal, but record the total intensity. So, these would not have any dip or azimuth.

Source Code

F

Subsource Code

Z, **N**, **E** - Magnetic

Dip/Azimuth: Not applicable

Signal Units: `T` (Tesla)

4.3.8 Humidity

Absolute/relative measurements of humidity. Temperature recordings may also be needed for meaningful results.

Source Code

I

Subsource Code

O	Outside environment
I	Inside building
D	Down hole
1, 2, 3, 4	Cabinet sources
–	All other letters for mnemonic source types.

Dip/Azimuth: Not applicable

Signal Units: `%` (Percent)

4.3.9 Rotational Sensor

Measures solid-body rotations about an axis, commonly given in "displacement" (radians), velocity (radians/second) or acceleration (radians/second**2).

Source Code

J - Rotation rate sensor

Subsource Code - See *Geographic orientation codes* for more details.

N, E, Z	Traditional orientations of North (N), East (E), and Up (Z) *When within 5 degrees of true directions*
1, 2, Z	Orthogonal components, nontraditional horizontals
1, 2, 3	Orthogonal components, nontraditional orientations
T, R	For rotated components or beams (Transverse, Radial)
A, B, C	Triaxial (Along the edges of a cube turned up on a corner)
U, V, W	Optional components, also used for raw triaxial output

Dip/Azimuth: Axis about which rotation is measured following right-handed rule.

Signal Units: `rad`, `rad/s`, `rad/s**2` – following right-handed rule

4.3.10 Temperature

Measurement of the temperature at some location. Typically used for measuring:

1. Weather

- Outside temperature

2. State of Health

- Inside recording building
- Down hole
- Inside electronics

Source Code

K

Subsource Code

O	Outside environment
I	Inside building
D	Down hole
1, **2**, **3**, **4**	Cabinet sources
–	All other letters for mnemonic source types.

Signal Units: `degC`, `°C`, `K`

4.3.11 Water Current

Measurement of the velocity of water in a given direction. The measurement may be at depth, within a borehole or a variety of other locations.

Source Code

O

Subsource Code

None defined

Dip/Azimuth: Along current direction

Signal Units: `m/s` (meter/second)

Note: The special, administrative channel codes of **L_O_G** and **S_O_H** (both deprecated) do not denote water current and should be avoided when using the "O" Source Code.

4.3.12 Gravimeter

Measurement of a gravitational field.

Source Code

G - Gravitaional sensor

Subsource Code

Z - Traditionally **1** - Unknown, or not vertical**

Note: historically some channels from accelerometers have used a instrumentation code of **G**. As of August 2000 the FDSN defined the use of this code as limited to gravity.

Dip/Azimuth: Gravity field Vector

Signal Units: `m/s**2`

4.3.13 Electric Potential

Measures the Electric Potential between two points. This is normally done using a high impedance voltmeter connected to two electrodes driven into the ground. In the case of magnetotelleuric work, this is one parameter that must be measured.

Source Code

Q

Subsource Code

None defined

Dip/Azimuth: Not applicable

Signal Units: `V` (Volt)

4.3.14 Rainfall

Measures total rainfall, or an amount per sampling interval

Source Code

R

Subsource Code

None defined

Dip/Azimuth: Not applicable

4.3.15 Linear Strain

Dip/Azimuth are the line of the movement being measured. Positive values are obtained when stress/distance increases and negative when they decrease.

Source Code

S

Subsource Code - See *Geographic orientation codes* for more details.

N, **E**, **Z**	Traditional orientations of North (N), East (E), and Up (Z) *When within 5 degrees of true directions*
1, **2**, **3**	Nontraditional orientations

Dip/Azimuth: Along axis of measurement

Signal Units: `m/m` (meter per meter)

4.3.16 Tide

Measurement of depth of water at monitoring site. Not to be confused with lunar tidal filters or gravimeter output.

Source Code

T

Subsource Code

Z - Always vertical

Dip/Azimuth: Always vertical

Signal Units: `m` (meter) - Relative to sea level or local ocean depth

4.3.17 Bolometer

Infrared instrument used to evaluate average cloud cover. Used in astronomy to determine observability of the sky.

Source Code

U

Subsource Code

None defined

Dip/Azimuth: Not applicable

4.3.18 Volumetric Strain

Source Code

V

Subsource Code

None defined

Dip/Azimuth: Not applicable

Signal Units: `m**3/m**3`

4.3.19 Wind

Measures the wind vector or velocity. Normal notion of dip and azimuth does not apply.

Source Code

W

Subsource Code

S	Windspeed
D	Wind direction vector, relative to geographic north
H	Horizontal wind speed
Z	Vertical wind speed

Dip/Azimuth: Not applicable

Signal Units: `m/s`

4.3.20 Derived or generated channel

Time series derived from observational data or entirely generated by a computer.

> **Warning:** This code is deprecated. If no other *Source code* is applicable, a new code should be requested and allocated by the FDSN.

Source Code

X

Subsource Code

Similar to the observable data that was modified or the observable equivalent for generated time series (synthetics). See subsource codes for the corresponding observed channel.

Further Usage (DEPRECATED)

In order to document the provenance of the data, information must be available in the metadata for this channel that documents the algorithms, processes, or systems that modified or generated the time series. A channel comment, providing a Uniform Resource Locator (URL), must be included in the metadata. The information available at the URL must identify the processes that were applied to modify or generate the time series. This information must reference the FDSN web site (http://www.fdsn.org/x-instrument/).

4.3.21 Non-specific instruments

For instruments not specifically covered by an existing Source Code the Y Source Code can be used.

> **Warning:** This code is deprecated. If no other *Source code* is applicable, a new code should be requested and allocated by the FDSN.

Source Code

Y

Subsource Code

Instrument specific.

Further Usage (DEPRECATED)

In order to document the instrument type and provenance of the data, information must be available in the metadata for this channel that documents the instrument that was used to generate the time series. A channel comment, providing a short description of the instrument, the type of measurement it makes and a Uniform Resource Locator (URL) referencing the FDSN web site (http://www.fdsn.org/y-instrument) that fully describes the instrumentation.

4.3.22 Synthesized Beams

This is used when forming beams from individual elements of an array.

Source Code

Z

Subsource Code

I	Incoherent beam
C	Coherent beam
F	FK beam
O	Origin beam
D	Wind direction vector, relative to geographic north

Dip/Azimuth: Ground motion vector

Signal Units: `m`, `m/s`, `m/s**2`

CHAPTER

FIVE

CHANGES

Changes to this specification are listed below.

5.1 September 2020

- Initial specification of Source Identifiers with the included *Changes from SEED 2.4*.

CHAPTER

SIX

BACKGROUND

The Standard for the Exchange of Earthquake Data (SEED) was adopted by the FDSN in the 1987 and has served as the dominant standard for seismological research data archiving and exchange.

This specification of identifier is an expansion and enhancement of the identifiers defined in SEED version 2.4.

6.1 Changes from SEED 2.4

In SEED, a unique data source is identified in using *network*, *station*, *location* and *channel* codes, each of which is incorporated into the source identifer scheme described in this specification. Below is an overview of significant changes from the codes as used in SEED 2.4.

- Expand maximum length of each code as follows:
  - *network* code: 2 => 8 characters
  - *station* code: 5 => 8 characters
  - *location* code: 2 => 8 characters
- Subdivide the channel code into individually delimited codes, allowing expansion of each:
  - The channel code set becomes "band_source_subsource", where:
    * **Band** indicates the general sampling rate and response band of the data source, same meaning as SEED.
    * **Source** is a code identifying an instrument or other data producer, called the *instrument* code in SEED.
    * **Subsource** is a code identifying a sub-category within the source, often the orientation, relative positon, or sensor type. Called the *orientation* code in SEED.
  - Single character versions of these individual codes are the same as SEED 2.4
    * Example: SEED 2.4 channel **BHZ** becomes **B_H_Z** in a source identifier.
  - Use of FDSN-defined codes is required (except for **A** and **O** band codes)
- Allow dash "-" character (ASCII 45) in station and location codes.
- Document a convention for temporary network codes: include 4 digit year identifying the start year of a deployment or experiment. As network codes are much larger than in SEED, they can be globally unique and would not need to be re-used.
- Specify a Uniform Resource Identifier (URI)-like string as a "source identifier" (SID) constructed from a combination of the network, station, location and channel codes. This SID provides a convenient, flexible, single identifier for use in data formats, request mechanisms, etc. while allowing mapping back-and-forth between the SID and the separate codes as needed.

- **Specific sampling rate ranges for band codes:**
    - **U**: >= 0.01 to < 0.1 sps
    - **V**: >= 0.1 to < 1 sps
- **Band code W added to fill the sampling rate gap between U and R:**
    - **W**: >= 0.001 to < 0.01 sps
- Band code **J** added for > 5000 sps.
- Band code **I** added for irregular sampling.
- Band code **A**, **O** deprecated.
- Source codes **X**, **Y** deprecated.
- search