

Detector Characterization

Kazuhiro Hayama

On behalf of DET subsystem

Human Resources, Cooperation

- **Chair : Hayama**
- **Active members on software development :**
Yamamoto, Yuzurihara, Miyamoto (OCU), Itoh (RESCEU)
- **Measurement of environment :**
KAGRA members + ERI +OCU

Tasks

- **Environmental monitor sensors with GIF**
- **Environment and Instrument monitor**
- **Development of characterization system**

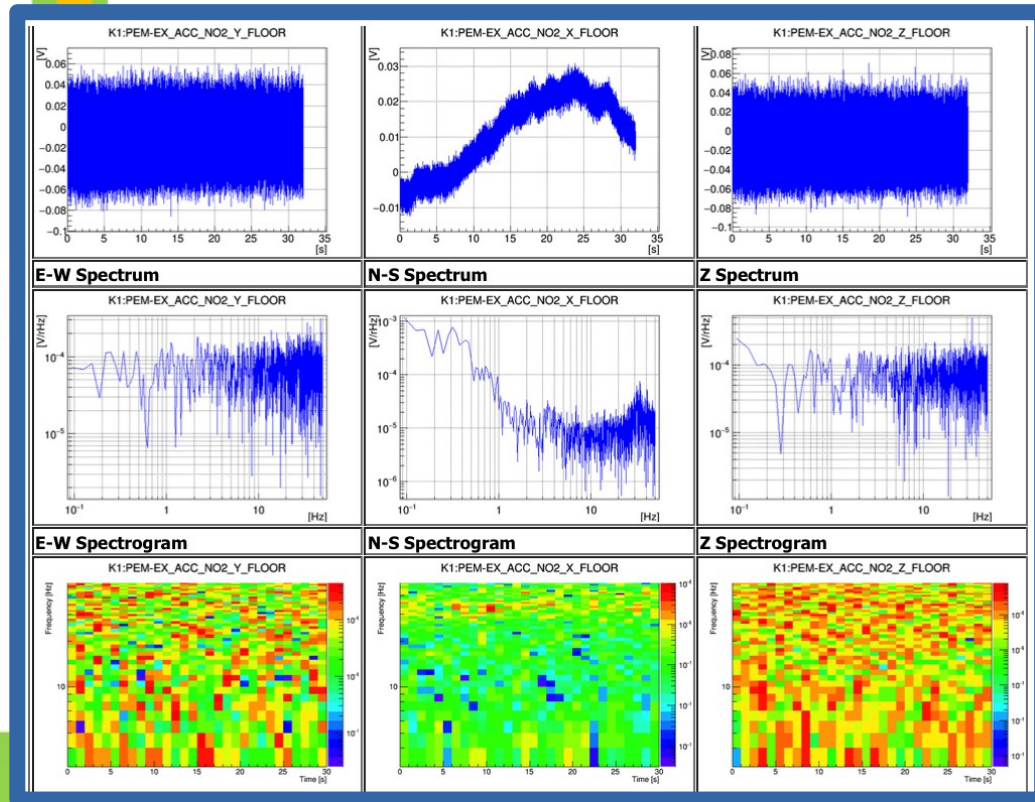
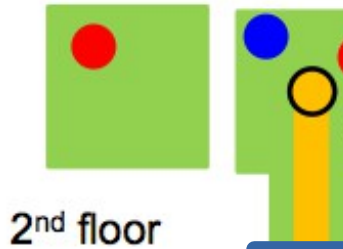
Preparing Environmental Sensors

With GIF

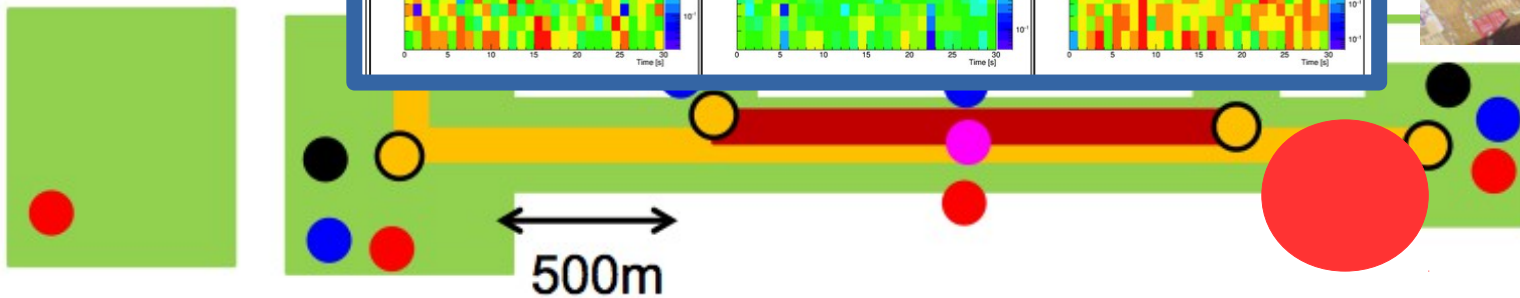
- **Hygrometer, thermometer, barometer are tested at the center area of KAGRA now.**
- **Seismometers, accelerometers are waiting for installation. (Feb ~ earlyMarch)**
- **Magnetometers will be introduced in the middle of this March.**
- **Slow data acquisition system will be set up ~early this March.**

Real-time environment monitor

Env Monitor at the X-End



2nd floor



Preparation of monitoring system

[General](#) | [VIS](#) | [IOO](#) | [Bruc](#) | [Web Tools](#)

Daily Summary Page

IOO

Calendar

Feb. 2016
 Mon. Tue. Wed. Thu. Fri. Sat. Sun.
 1 2 3 4 5 6 7
 8 9 10 11 12 13 14
 15 16 17 18 19 20 21
 22 23 24 25 26 27 28

Jan. 2016
 Mon. Tue. Wed. Thu. Fri. Sat. Sun.
 1 2 3
 4 5 6 7 8 9 10
 11 12 13 14 15 16 17
 18 19 20 21 22 23 24
 25 26 27 28 29 30 31

Dec. 2015
 Mon. Tue. Wed. Thu. Fri. Sat. Sun.
 1 2 3 4 5 6
 7 8 9 10 11 12 13
 14 15 16 17 18 19 20
 21 22 23 24 25 26 27
 28 29 30 31

Nov. 2015
 Mon. Tue. Wed. Thu. Fri. Sat. Sun.
 1
 2 3 4 5 6 7 8
 9 10 11 12 13 14 15
 16 17 18 19 20 21 22
 23 24 25 26 27 28 29
 30

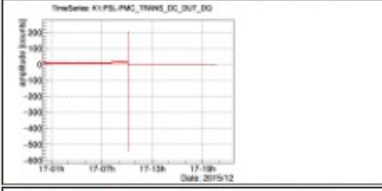
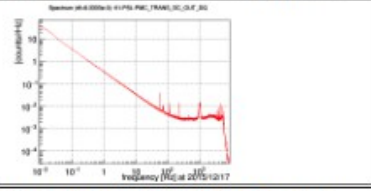
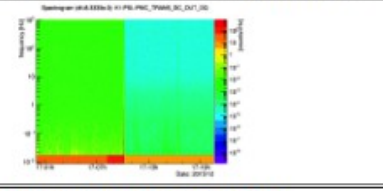
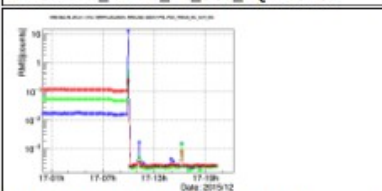
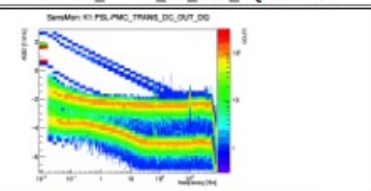
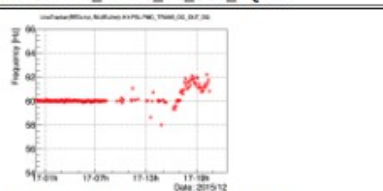
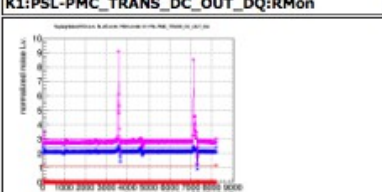
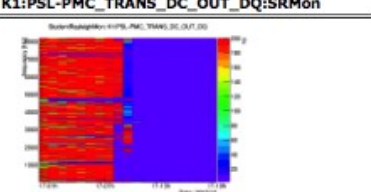
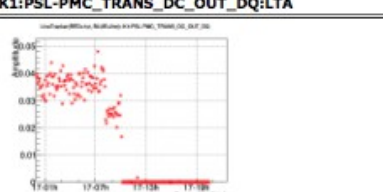
Oct. 2015
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Sep. 2015
 Mon. Tue. Wed. Thu. Fri. Sat. Sun.
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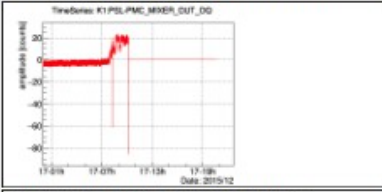
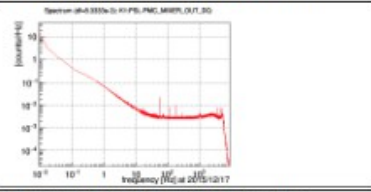
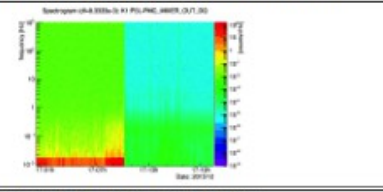

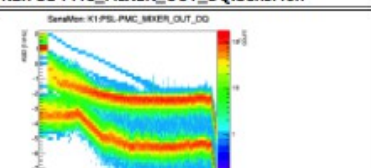
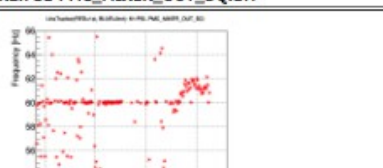
Aug. 2015
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 10 11 12 13 14 15 16
 17 18 19 20 21 22 23
 24 25 26 27 28 29 30
 31

Jul. 2015
 Mon. Tue. Wed. Thu. Fri. Sat. Sun.
 1 2 3 4 5

K1:PSL-PMC_TRANS_DC_OUT_DQ

K1:PSL-PMC_TRANS_DC_OUT_DQ:TimeSeries 	K1:PSL-PMC_TRANS_DC_OUT_DQ:Spectrum 	K1:PSL-PMC_TRANS_DC_OUT_DQ:Spectrogram 
K1:PSL-PMC_TRANS_DC_OUT_DQ:RMSMon 	K1:PSL-PMC_TRANS_DC_OUT_DQ:SensMon 	K1:PSL-PMC_TRANS_DC_OUT_DQ:LTF 
K1:PSL-PMC_TRANS_DC_OUT_DQ:RMon 	K1:PSL-PMC_TRANS_DC_OUT_DQ:SRMon 	K1:PSL-PMC_TRANS_DC_OUT_DQ:LTA 

K1:PSL-PMC_MIXER_OUT_DQ

K1:PSL-PMC_MIXER_OUT_DQ:TimeSeries 	K1:PSL-PMC_MIXER_OUT_DQ:Spectrum 	K1:PSL-PMC_MIXER_OUT_DQ:Spectrogram 
K1:PSL-PMC_MIXER_OUT_DQ:RMSMon 	K1:PSL-PMC_MIXER_OUT_DQ:SensMon 	K1:PSL-PMC_MIXER_OUT_DQ:LTF 

Web-Based Tools

[Single Channel Analysis](#)
[Coherence Analysis](#)
[Correlation Map](#)
[Bruco](#)
[Detection Range](#)
[Daily Summary page](#)

Date:

GPS Time: 1134572417
 Local Time:
 2015 Dec 20
 00:00 JST

Channel List:

[make channel list](#)
[select channel list \(Default\)](#)

Channel 1:

K1:PSL-FSS_FAST_MON_OUT_DQ
 K1:PSL-FSS_MIXER_OUT_DQ
 K1:PSL-FSS_PC_MON_OUT_DQ
 K1:PSL-FSS_REFL_DC_OUT_DQ
 K1:PSL-FSS_SLOW_MON_OUT_DQ

Parameters:

For General
 Duration: sec. (default is 32s)
 Freq. band: Hz ~ Hz
 (default is from 0Hz to Nyquist freq.)

Monitors:

Pearson Correlation MIC

plot view

HasKAL

GPS Time: 1134572417 (2015-12-19 15:00:00 UTC)

duration: 32s Freq. band: 0 - fNyquist Hz

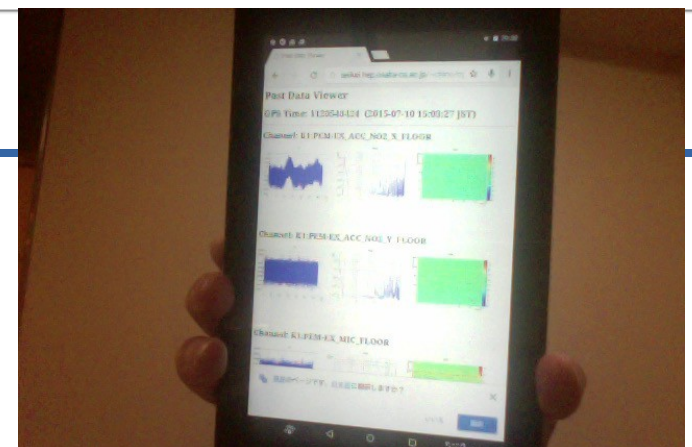
	K1:PSL-FSS_FAST_MON_OUT_DQ	K1:PSL-FSS_MIXER_OUT_DQ	K1:PSL-FSS_PC_MON_OUT_DQ	K1:PSL-FSS_REFL_DC_OUT_DQ	K1:PSL-FSS_SLOW_MON_OUT_DQ
K1:PSL-FSS_FAST_MON_OUT_DQ	1.00000	0.01447	0.02042	NaN	0.01939
K1:PSL-FSS_MIXER_OUT_DQ	0.01447	1.00000	0.01804	NaN	0.01404
K1:PSL-FSS_PC_MON_OUT_DQ	0.02042	0.01804	1.00000	NaN	0.02279
K1:PSL-FSS_REFL_DC_OUT_DQ	NaN	NaN	NaN	1.00000	NaN
K1:PSL-FSS_SLOW_MON_OUT_DQ	0.01939	0.01404	0.02279	NaN	1.00000

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Real time quick look page is [here](#)

Powered by [HasKAL](#)



Detchar software

Glitch Monitor

Non-Stationarity

- Line Finder
- Line Tracking
- Line Removal

Line

- Rayleigh Monitor
- Non-Gaussianity Monitor
- RMS Monitor
- Noise Floor Monitor

Gaussianity

- Time-Series Monitor
- Spectrum Monitor
- Spectrogram Monitor

Time-Series Spectrum

- Sensitivity Monitor
- Range Monitor

GW Range

- Inspiral
- Inspiral-Merger-Ringdown
- Ringdown
- Stochastic

Correlation

- Coherence Finder
- Multiple-channel coherence monitor (BruCo)
- Pearson correlation Finder
- NonLinear correlation Finder

Realtime Quick look webpage

- Daily summary webpage
- GUI Interface
- Web-Base Interface
- Command-line Interface

User Interface

- Health monitor
- File Finder (New)

System Health

- Globally Correlated magnetic noise
- Violin mode
- Multi-channel analysis
- Newtonian noise
 - Effect of water inside the mountain

Example : GW150914

Data Characterization around GW150914

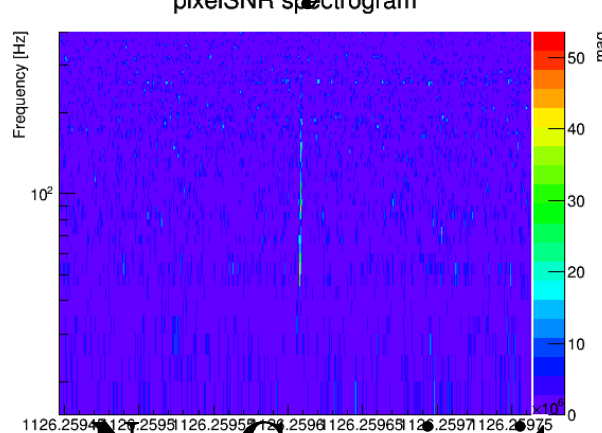
<http://seikai.hep.osaka-cu.ac.jp/~chino/GW150914/characterizeGW150914.html>

- Seen the signal clearly
- Amp. of Power line(60Hz) fluctuated $\sim \pm 5E-21$
- Amp. of 500Hz line decreasing
- $>100\text{Hz}$, Gaussianity pretty good
- $<100\text{Hz}$, non-Gaussian
- 516Gz line: strange behavior.

Yuzurihara, Yamamoto

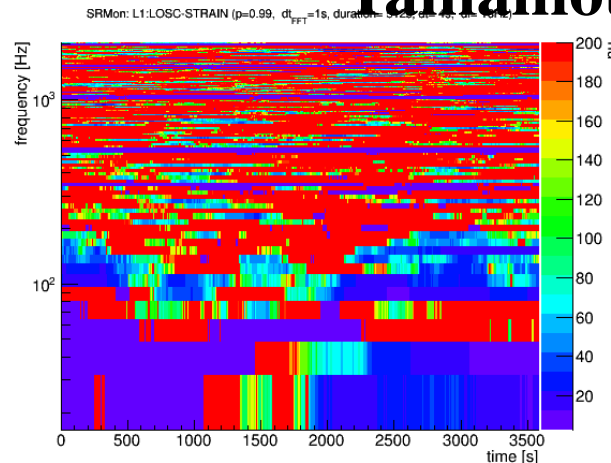
Glitch pipeline

Hayama



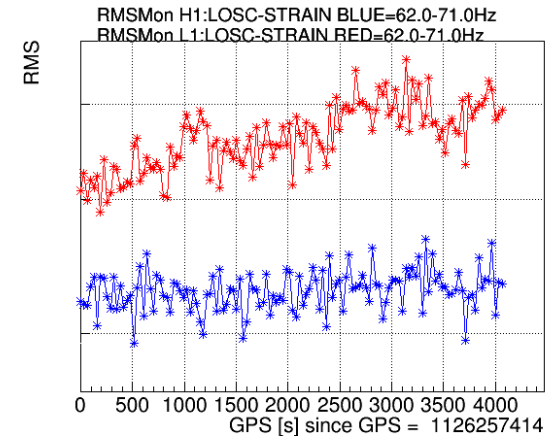
Non-Gaussianity

Yamamoto



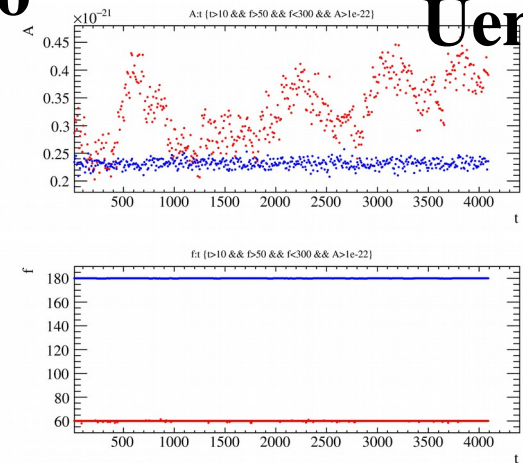
BLRMS (60~70Hz)

Yuzurihara



Line Tracking

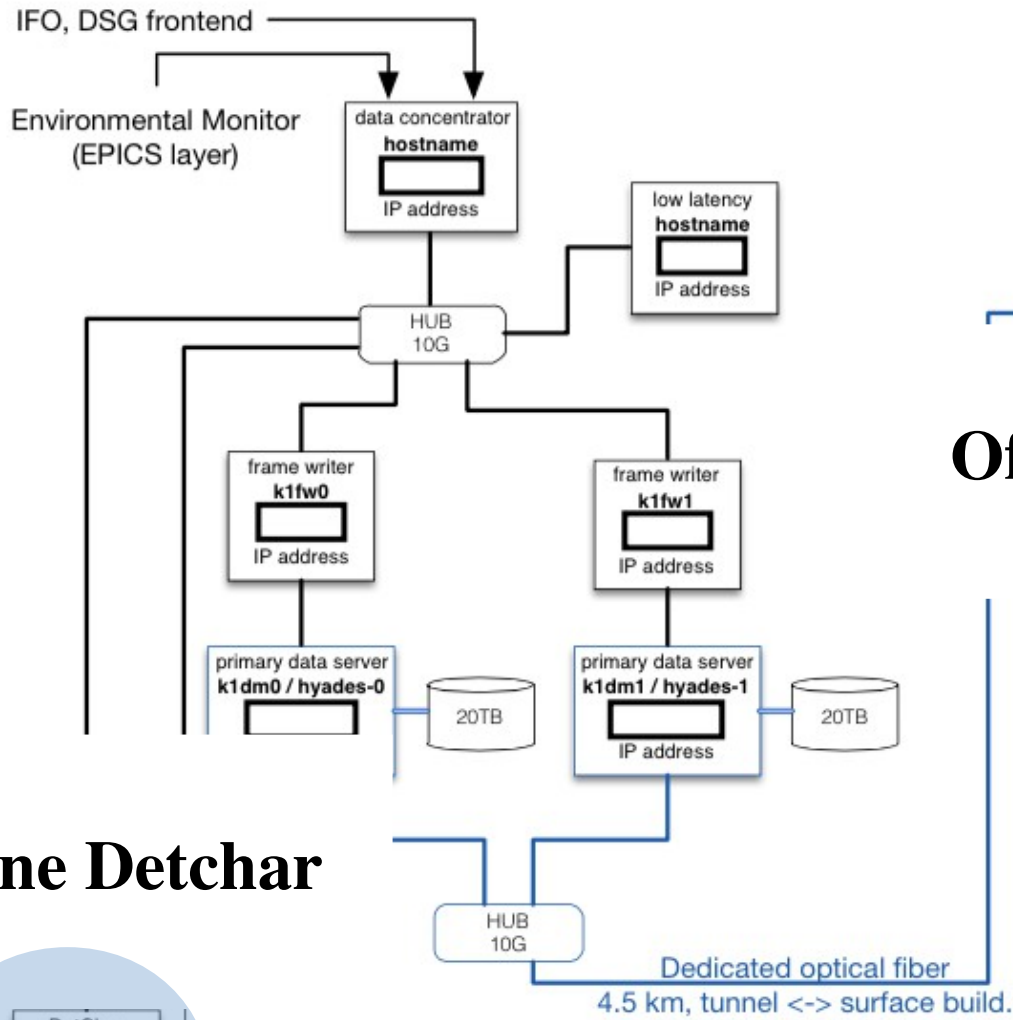
Ueno



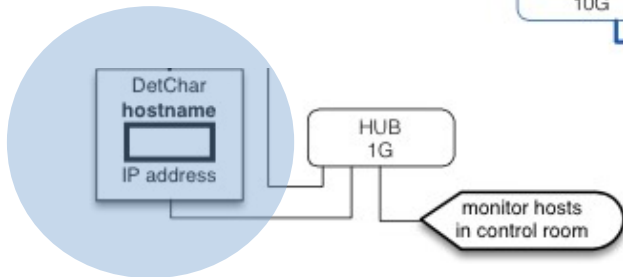
Toward bKAGRA

- **Addition of Guardian info to the webpage(also for iKAGRA)**
- **Initial PEM plan will be finished in ~ this summer.**
- **Measurement of the magnetic field around mirrors**
- **Development of PEM injection system**
- **Channel selection to monitor deeply**
 - **With Subsystems**
 - **With PEM injection study(2016-2017)**

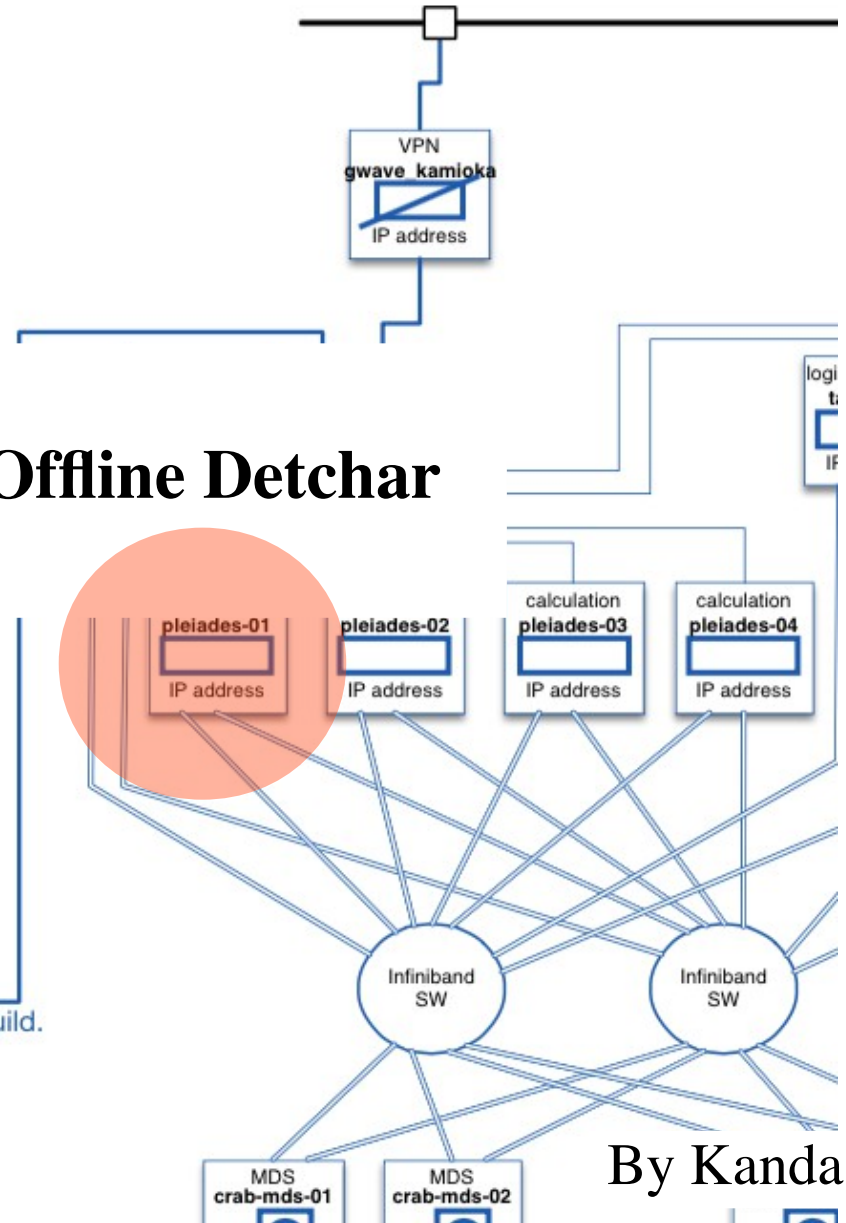
Network



Online Detchar



Offline Detchar



By Kanda