Current status of Detector Characterization
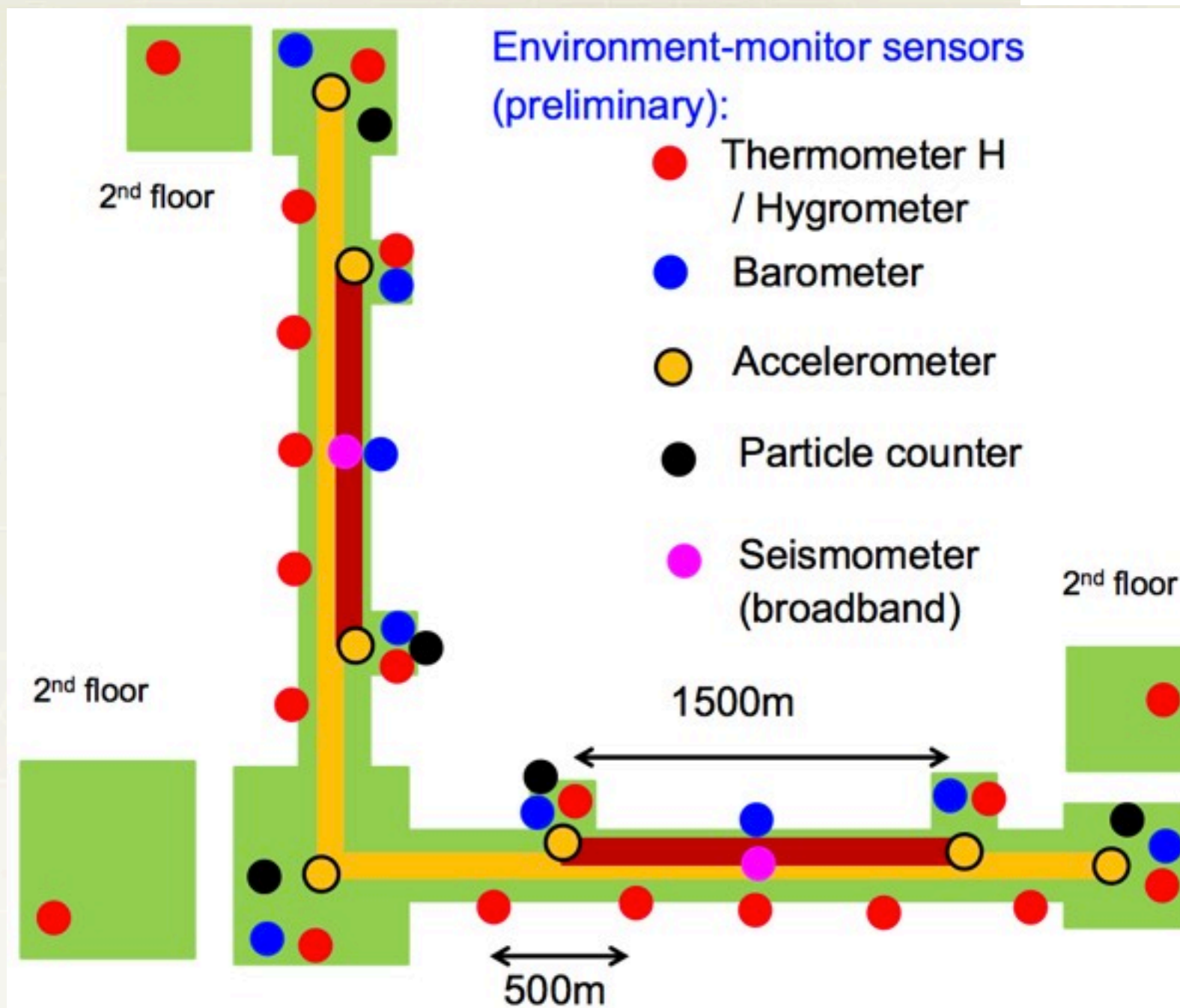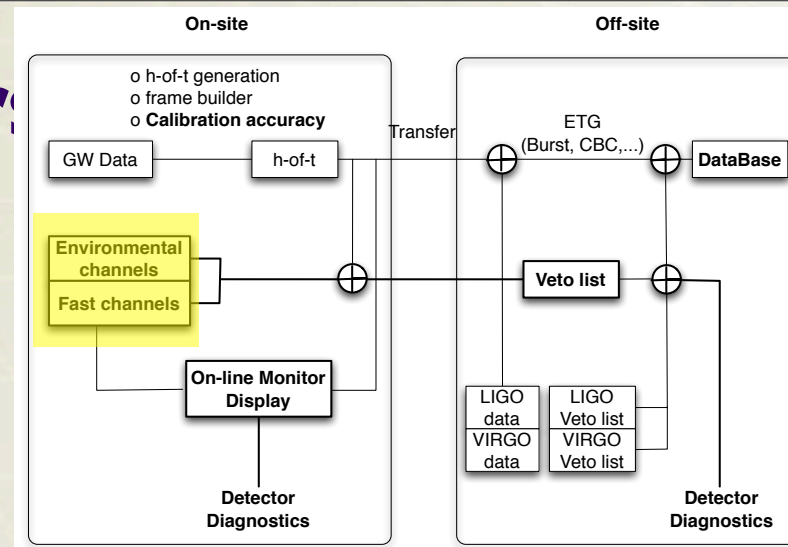
Kazuhiro Hayama on behalf of the research team

1

- Determine which data segment is available for science.

- Detector diagnostics- finding non-stationary components in channels. The best way is to kill noise sources before LCGT observing.

- Construction of detchar system in a pre-process server.

- Evaluation/setting of EMs with GIF

- Veto list

- Distribution of veto list to other collaborations.

- Influence of the accuracy of calibration on h-of-t reconstruction.

- The unique information of LCGT should be taken care with detchar and distributed so that other collaborators are not concerned about it to some extent.
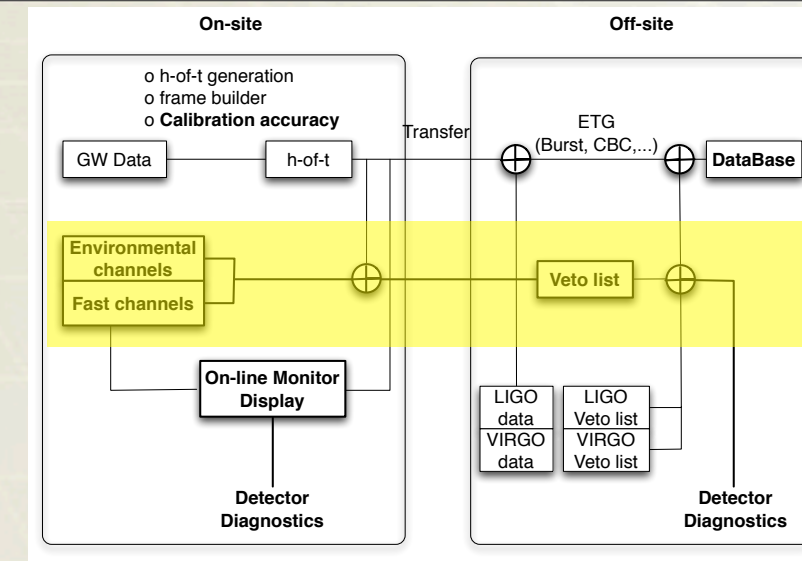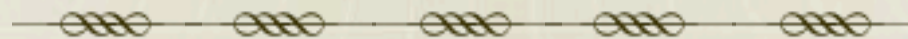
Diagram

2012年2月3日金曜日
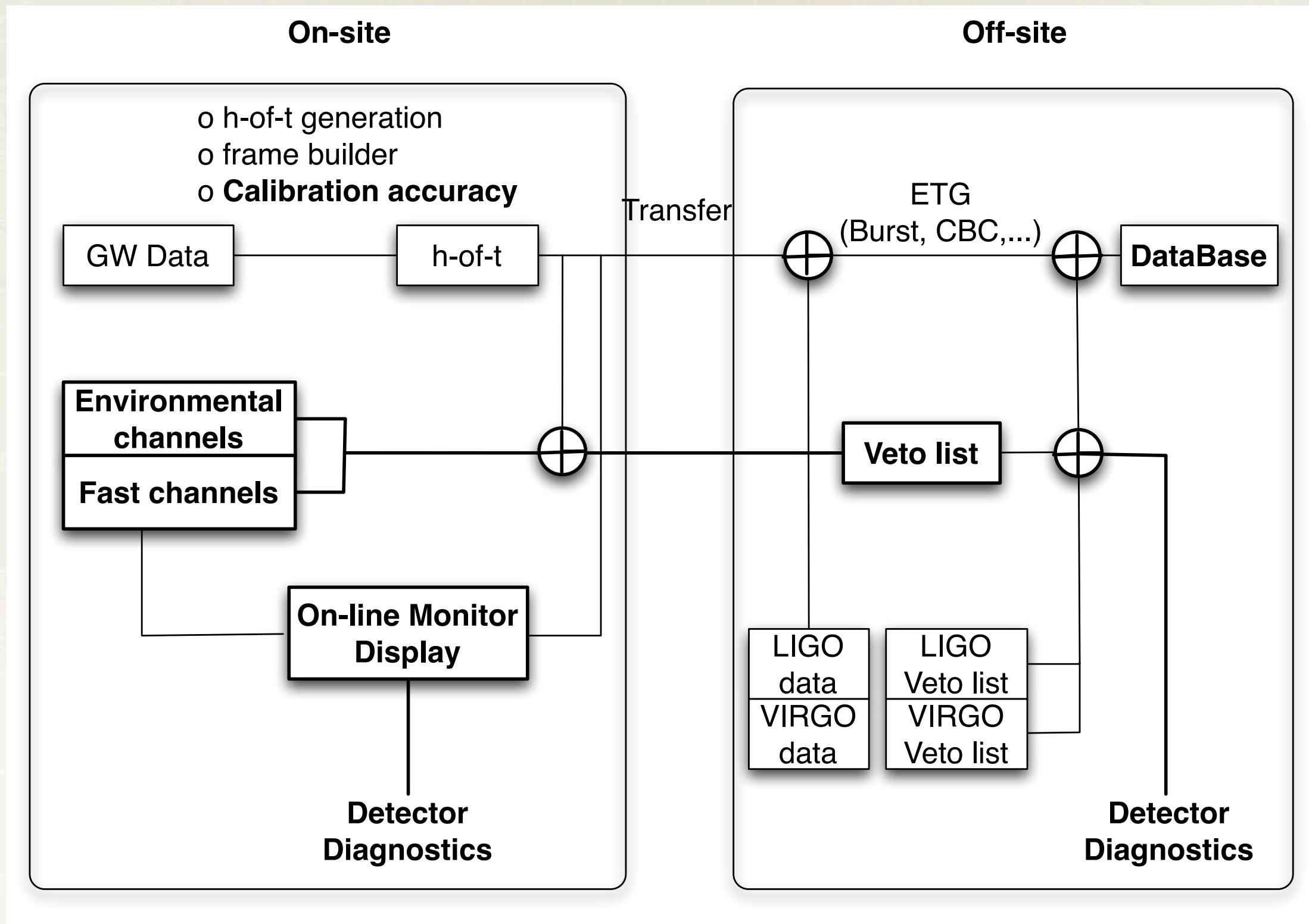
Environmental monitor sensors
Number, type will be decided in this year.

should add
magnetometers
to Ends, Center

Seismometers
at Ends?

Environment-monitor sensors (preliminary):

- 🔴 Thermometer H / Hygrometer
- 🔵 Barometer
- 🟠 Accelerometer
- ⚫ Particle counter
- 🟣 Seismometer (broadband)

2nd floor

1500m

500m

4

Veto-list generation

- 🔴 **Data quality information**
    - 🟢 **Real-time segment generation
    Data quality information of science mode, lock, calibration,...
    Segment database**
- 🔴 **Triggered event database**
- 🔴 **Real-time veto analysis**
- 🔴 **Channel information system**
- 🔴 **Validation tools for segment**
- 🔴 **Daily Report tool**

5

(cont'd) Veto-list : Target sources
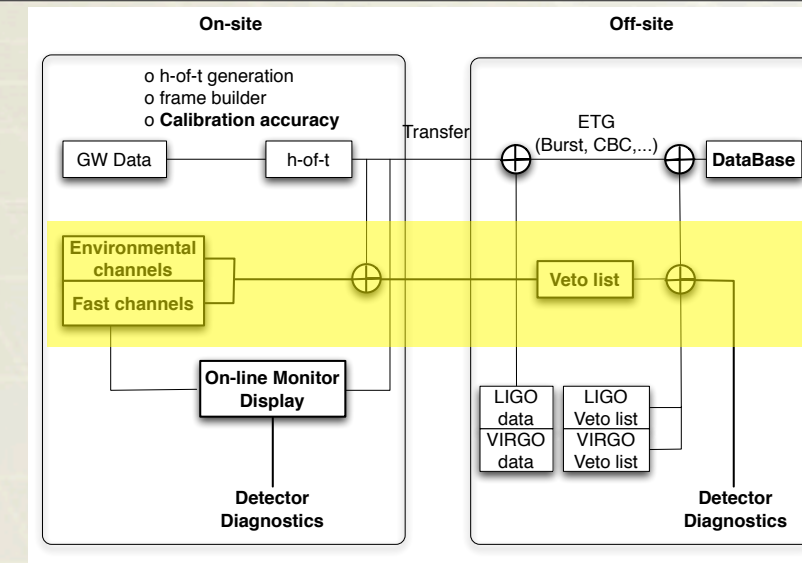

Transient GW search (CBC, Burst)

- **Real-time glitch detection**
- **Glitch classification**
- **Coincidence analysis between the GW channel and auxiliary sensor channels.**
- **...**

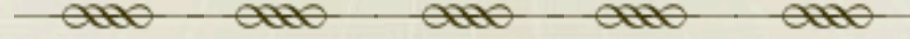## Continuous GW search (pulsar, LMXB)

- **Line tracking**
- **Line detection**
- **Removal of high frequency spikes**
- **...**

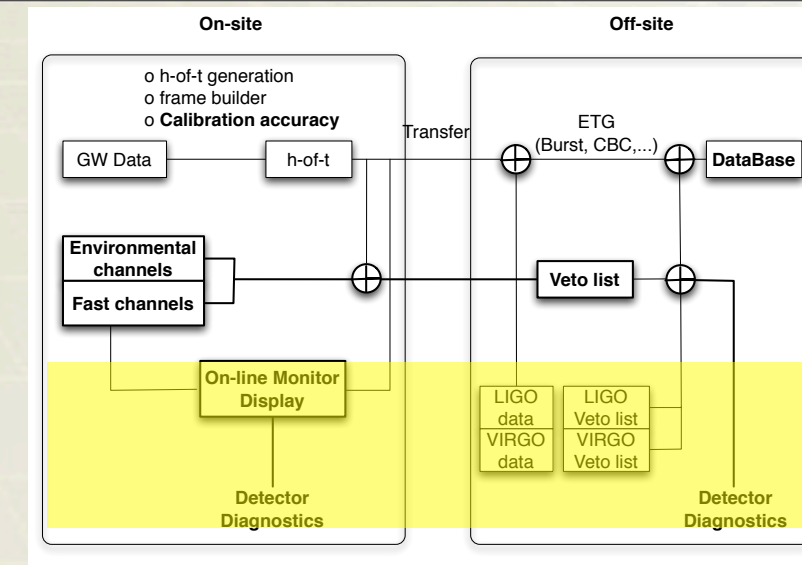## Stochastic GW search (Early univ, ...)

- **Noise Floor monitor**
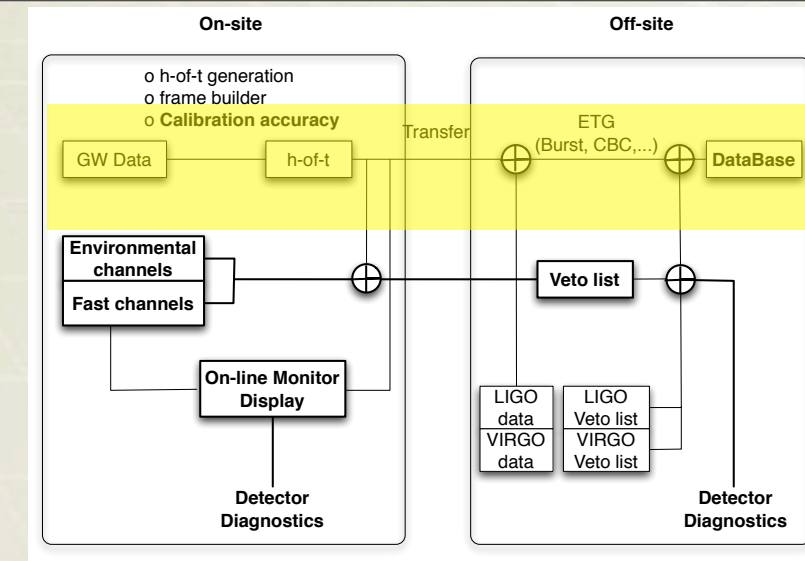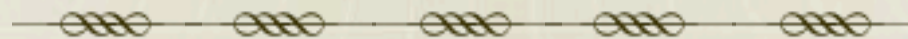
6

Detector diagnostics

Provide information of data quality, non-stationary components, monitoring tools.
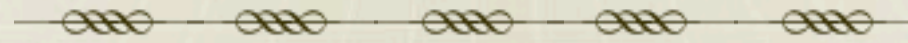
🔴 **Glitch detection pipeline**

🔴 **Coincidence analysis between channels, channel and h-of-t,...**
Find correlation between channels,

🔴 **Noise floor monitor tool**

🔴 **...**

Calibration accuracy

- 🔴 **Hardware injection test**
- 🔴 **Waveform reconstruction**

I. **Prototype test in CLIO**
  o **Installation test of base detchar system at NAOJ and soft development.**
  o **Operation test of base detchar system during CLIO operation.**
  o **Software development**

II. **Computation platform**
  o **2Q-4Q2014: Implementation of detchar system in a pre-process server.**
  o **1Q-3Q2015: Installation of the pre-process server to a building.**

III. **Test operation**
  o **Test operation of the detchar system when EM operation in GIF ~March in 2015.**
  o **Operation of the detchar system during GIF operation from ~ June, 2015.**
  o **Operation during iKAGRA in ~ Nov. 2015.**
  o **Software development**

IV. **Operation**
  o **Operation during bKAGRA from ~ Aug. 2018.**

9

2012年2月3日金曜日

Hayama(NAOJ), Miyakawa(ICRR), Yamamoto, Yuzurihara(OCU), Susa(Titech), Dan (UT)

- Simple standalone system (RT PC + ADC, Client WS, router) has been delivered to NAOJ on 12/6/2011.
- 3days work for installation, lecture and training
- Online analysis software will be developed by DAS group.

Diagnosis on Mac through wireless LAN

RT PC + ADC

Client WS

37

10
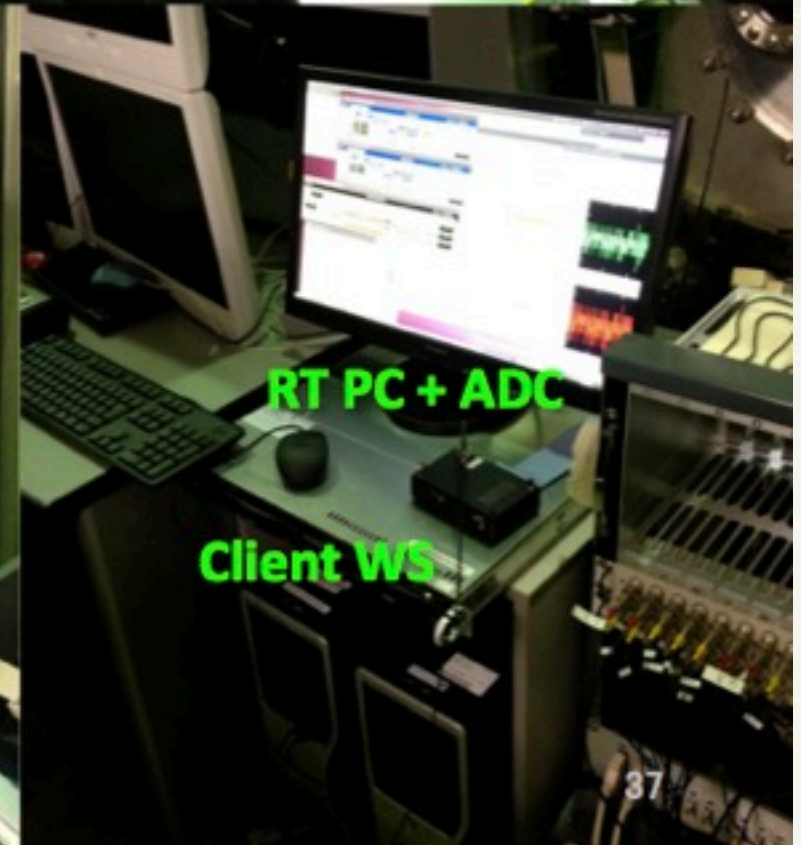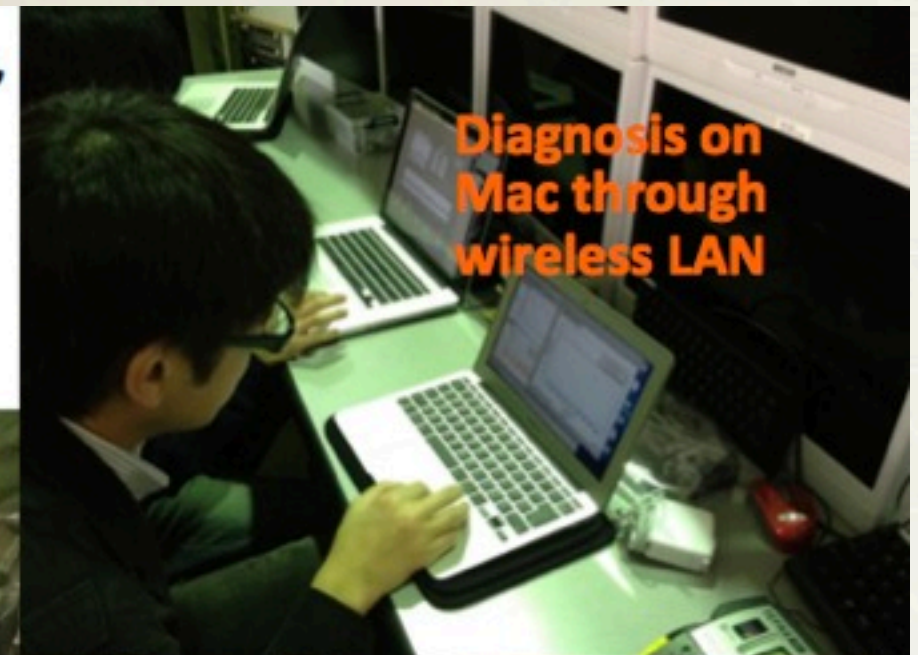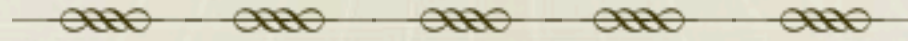
- **Import of LVC software**
  - **Data quality monitor**
  - **Glitch detection pipeline**
  - **Coincidence analysis pipeline**

- **New software requirement / sophistication**
  - **Glitch classification**
  - **Noise modeling (power spectrum and, probably, glitch)**
  - **Tools to know when and how glitches shows up?**

Application of ANNs to Glitch Identification Study using Auxiliary Channels

John J. Oh[1], Sang Hoon Oh[1], Young-Min Kim[1,2], Chang-Hwan Lee[2], Edwin J. Son[3], Ruslan Vaulin[4], Lindy Blackburn[5]

[1] National Institute for Mathematical Sciences [2] Pusan National University
[3] Sogang University [3] MIT [4] Goddard Space Flight Center, NASA

Goals: Applying artificial neural networks (ANNs) to auxiliary channel information,

✦ Provide a highly efficient and reliable noise transient (glitch) identification tool

✦ Develop a method to trace down the culprit channel(s) causing noise transient in strain data

✦ Potentially establish a new ranking statistic useful for CBC search

12

input:
aux channel

neural networks

decision

Is strain data glitchy or clean?

1 or 0

+

Optimal input parameters of ANNs

Genetic Algorithm

2012年2月3日金曜日