

DEVELOPMENT OF DATA LOGGING AND DISPLAY SYSTEM, MyDAQ2

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What is MyDAQ ?

- MyDAQ[1] is a simple data logging and display system
- MyDAQ acts as a server that..
 - receives data via network
 - saves data to its relational database
 - displays data as time chart on the web.
- It is so call “a web-based chart recorder”.

MyDAQ is presented in PCaPAC 2005.

[1] A. Yamashita and T. Ohata,
“MyDAQ, a Simple Data Logging and Display Server”,
Proc. of PCaPAC'05, Hayama, Japan, 2005.

What is MyDAQ2 ?

- MyDAQ was very simple.
 - But...
An actual data acquisition system requires more features
- We upgraded MyDAQ to MyDAQ2.

Web-site of MyDAQ2 : <http://acc-web.spring8.or.jp/~hirono/>
Under construction...

Outline

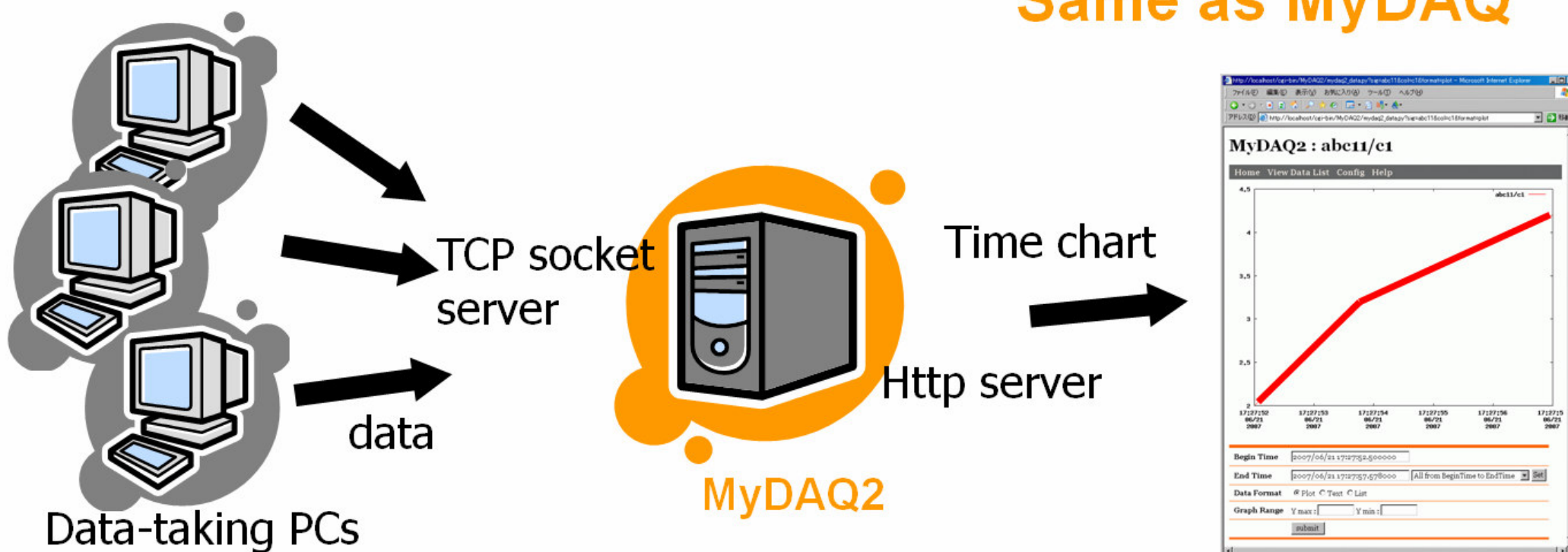
- Overview of MyDAQ2
 - Structure of MyDAQ2
- How to use MyDAQ2
 - 3 steps to use
- New features of MyDAQ2
 - 6 major upgraded features.
- Application system of MyDAQ2
 - New data storage system in SPring-8
- Conclusion

Overview of MyDAQ2

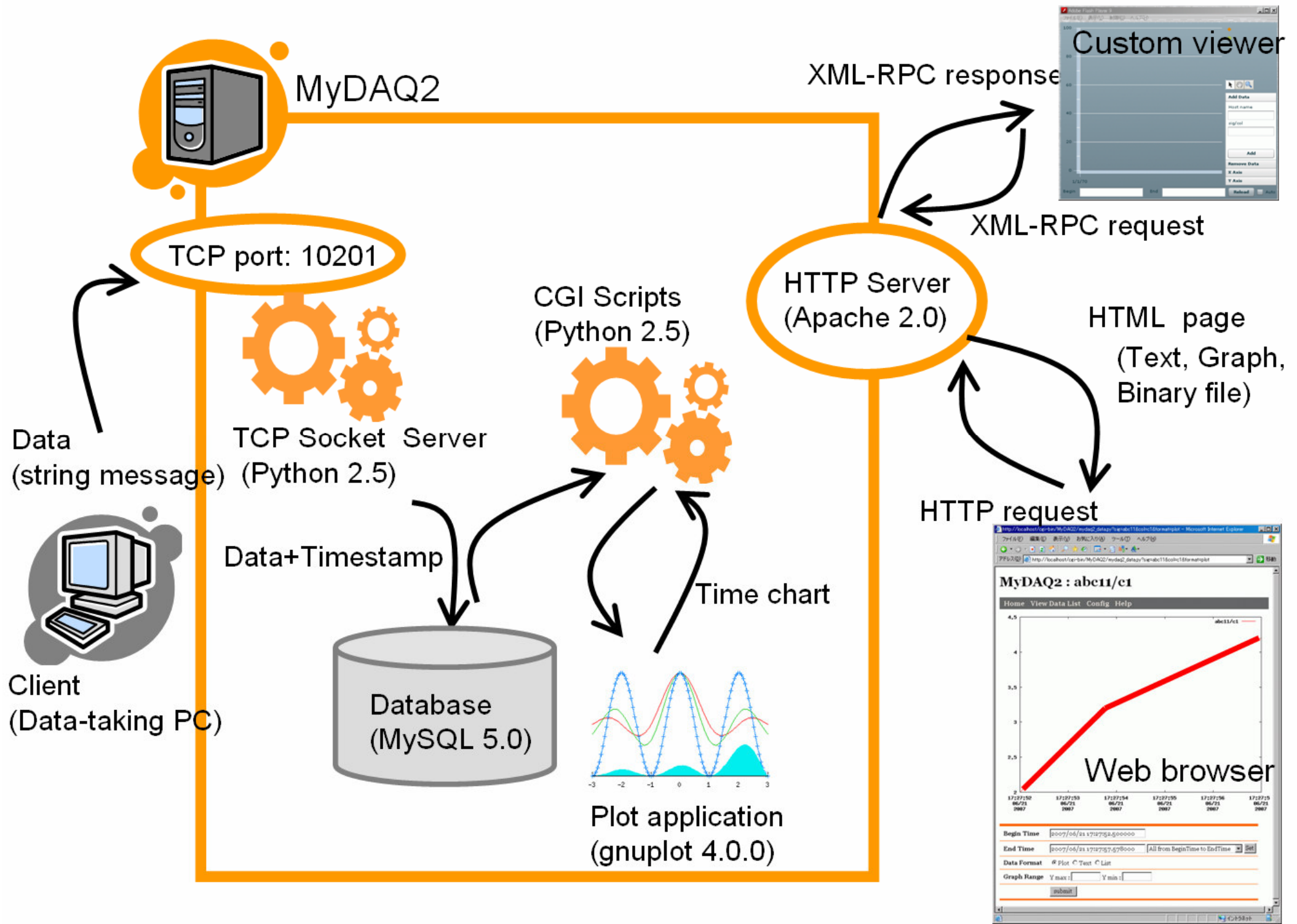
Overview of MyDAQ2

- The design concept of MyDAQ2 is basically the same as that of MyDAQ,
 - MyDAQ2 receives data from data-taking PCs via network, saves to its relational database and displays data as time chart on the web.

Same as MyDAQ



Structure of MyDAQ2



Overview of MyDAQ2

- MyDAQ2 is designed as...
 - Simple
 - Multi-platform and –programming language supported
 - SQL-free
 - but user obtains benefit of a relational database
 - Suitable for rather small (<1000 signal), slow (~ a few Hz), long term (>1yr) data acquisition.

Same as MyDAQ

Overview of MyDAQ2

- For example, MyDAQ2 can be used for
 - Monitoring degree of vacuum
 - Logging a correlation between position of mirrors and room temperature
 - ...

Overview of MyDAQ2

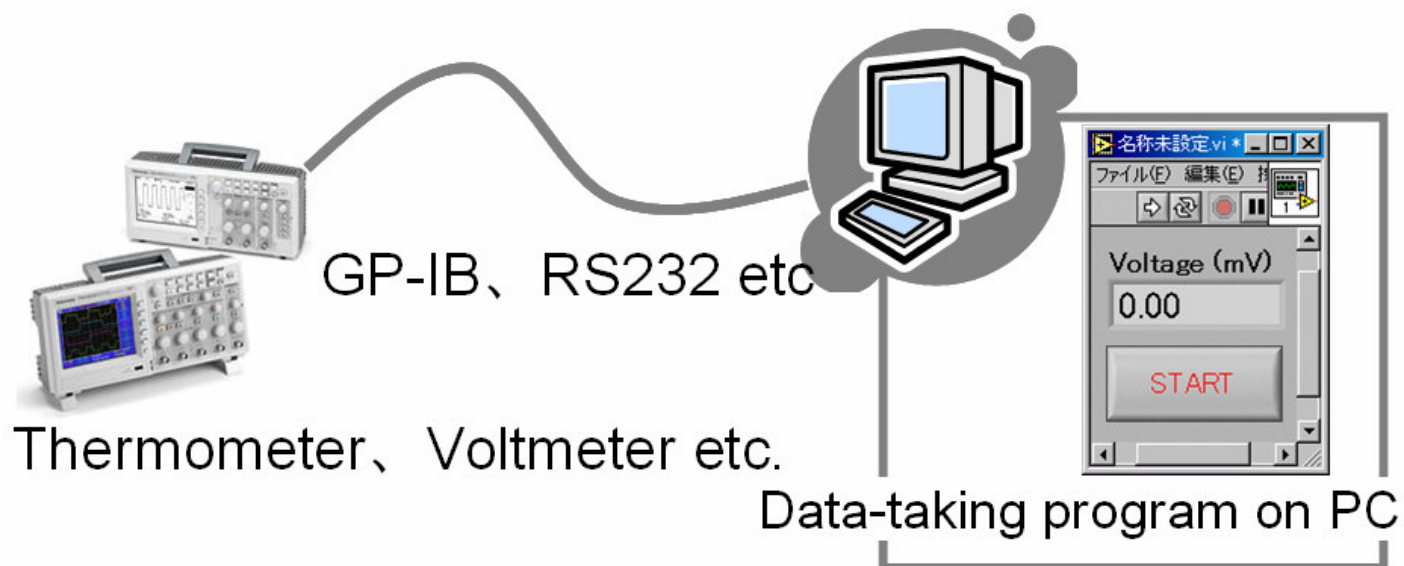
- For example, MyDAQ2 can be used for
 - Monitoring degree of vacuum
 - Logging a correlation between position of mirrors and room temperature
 - ...



Thermometer、Voltmeter etc.

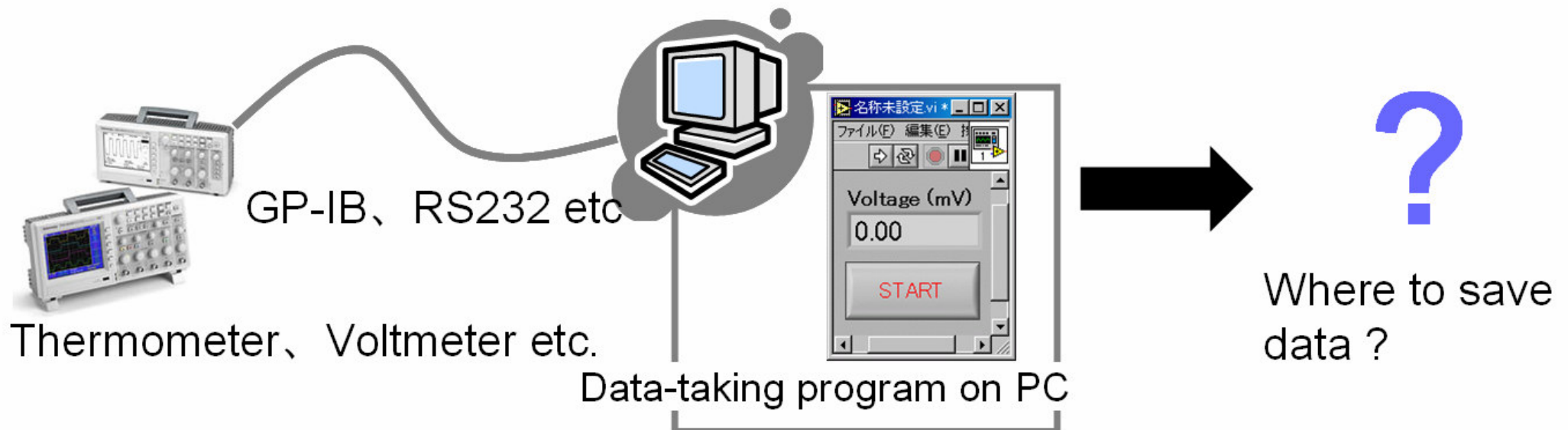
Overview of MyDAQ2

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 - ...



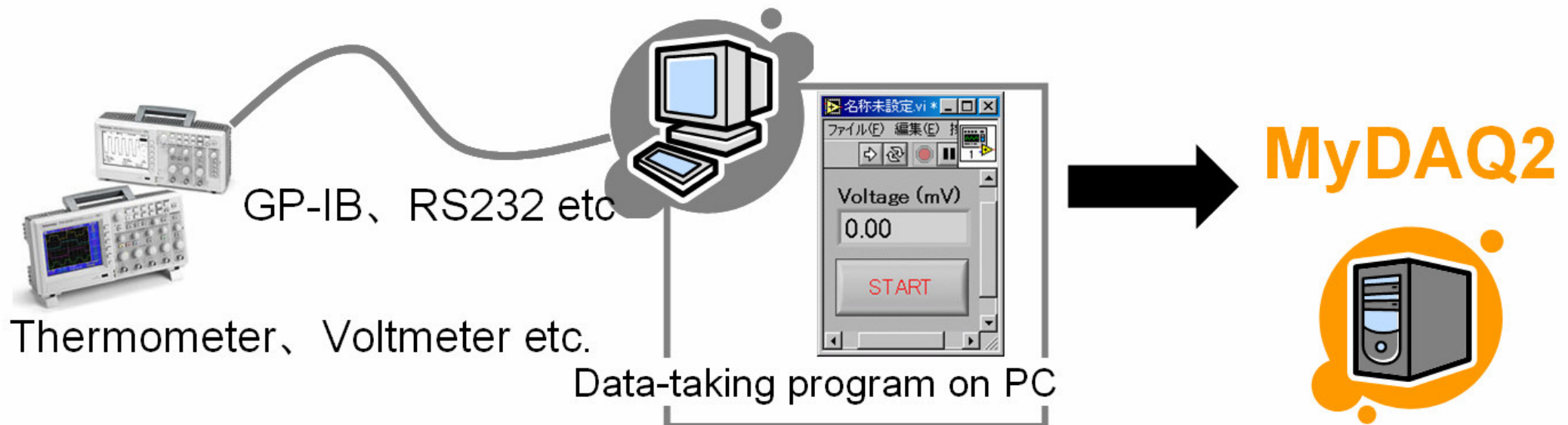
Overview of MyDAQ2

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Overview of MyDAQ2

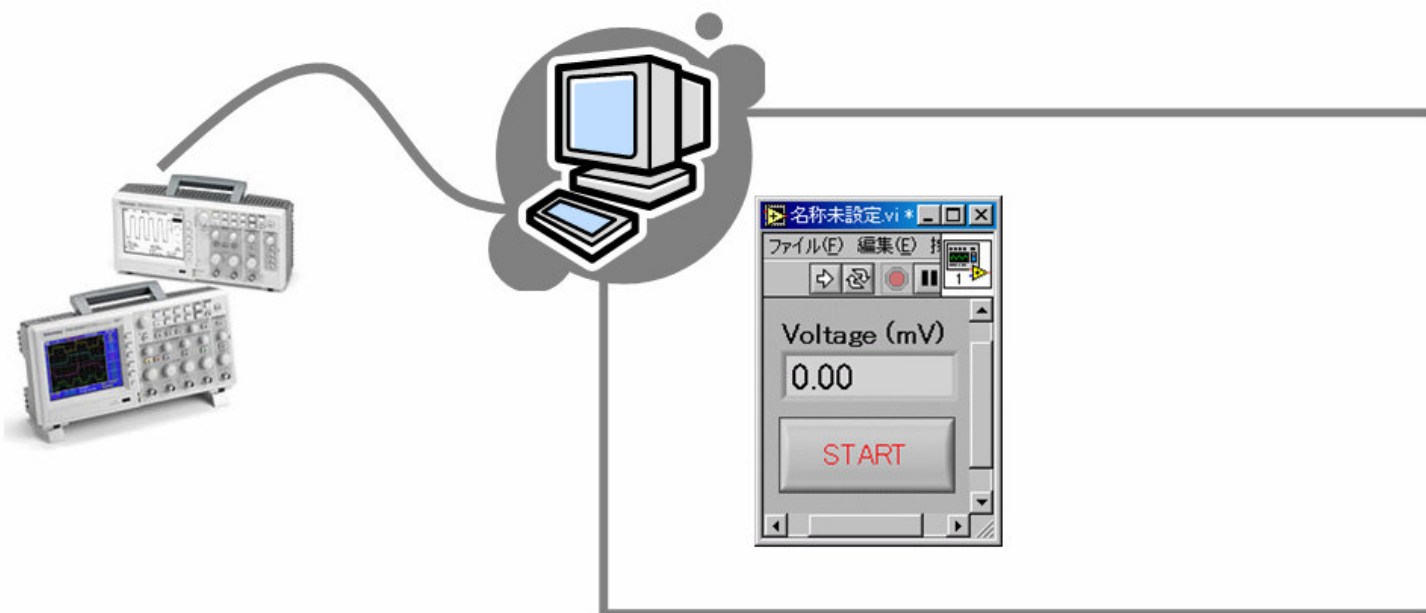
- For example, MyDAQ2 can be used for
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 - Logging a correlation between position of mirrors and room temperature
 - ...



How to use MyDAQ2?

How to use MyDAQ2

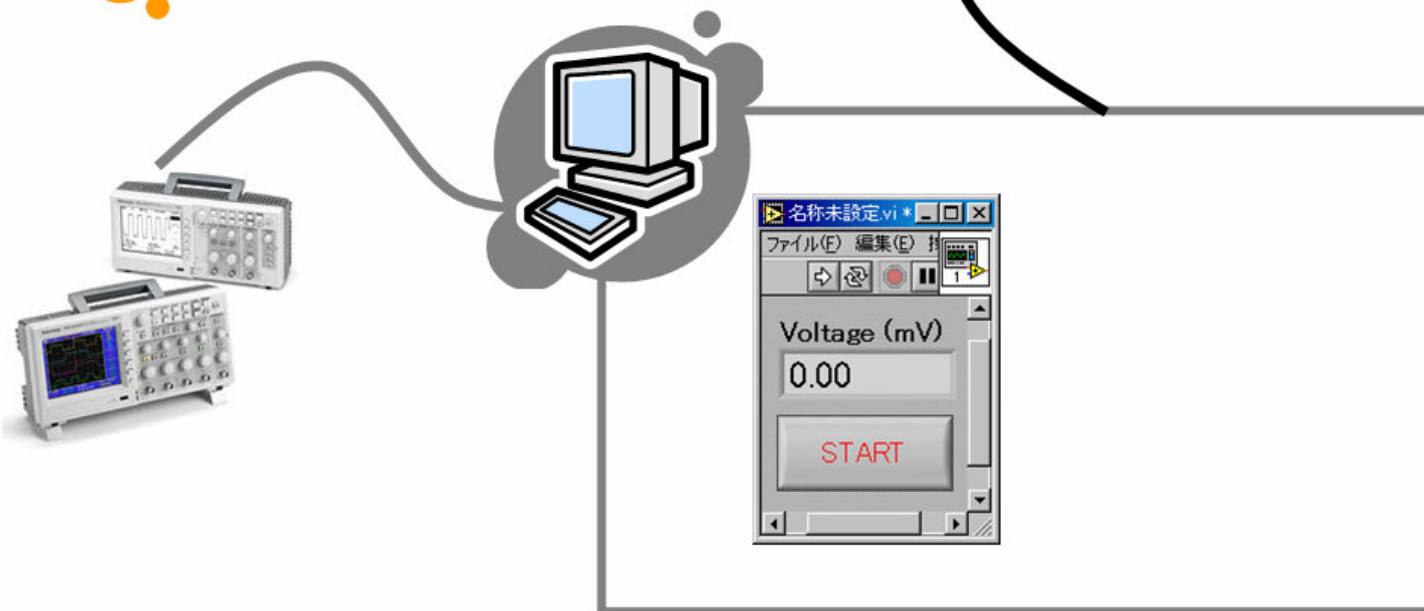
There is 3 steps to use MyDAQ2.



How to use MyDAQ2

There is 3 steps to use MyDAQ2.

Step1. Install MyDAQ2



How to use MyDAQ2

There is 3 steps to use MyDAQ2.

Step1. Install MyDAQ2

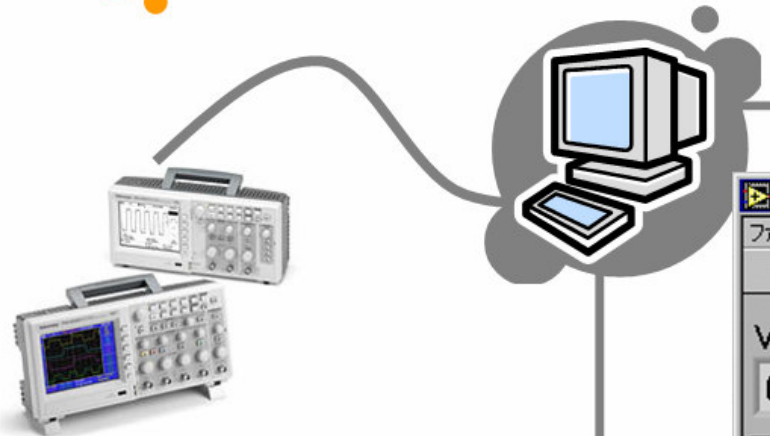


Step2. Add a simple TCP socket client-sequence to your data-taking program

How to use MyDAQ2

There is 3 steps to use MyDAQ2.

Step1. Install MyDAQ2



Step3. Check data on the web



Step2. Add a simple TCP socket client-sequence to your data-taking program



How to use MyDAQ

Step1. Install MyDAQ2

- Install applications and scripts of MyDAQ2.
- The applications are...

Application	Application Name	Version
Http server	Apache	2.0
Plot application	gnuplot	4.0
Relational database	MySQL	5.0
Script Engine	Python	2.5
	Twisted	2.5
	MySQL-python	1.2
TCP socket server	mydaq2server.py	2
CGIs scripts	mydaq2_*.py	2

} Python scripts

How to use MyDAQ

Step1. Install MyDAQ2

- MyDAQ2 can be installed on most of OSs
Windows, Linux, or Macintosh....
- Because, the applications used by MyDAQ2 are open-source and supported by most of OSs.
- Installation is easy.
- Because, these applications have a user-friendly installer.

MyDAQ2 is a easy-to-start system.

Application	Application Name	Version
Http server	httpd [3]	2.3
Plot application	gnuplot [4]	4.0
Relational database	MySQL [5]	5.0
Scripting language	Twisted [6]	2.5
	MySQL-python [7]	1.2
TCP server	mydaq2server.py	2
CGIs scripts	mydaq2_*.py	2

python scripts

How to use MyDAQ2

Step2. Add TCP socket client-sequence

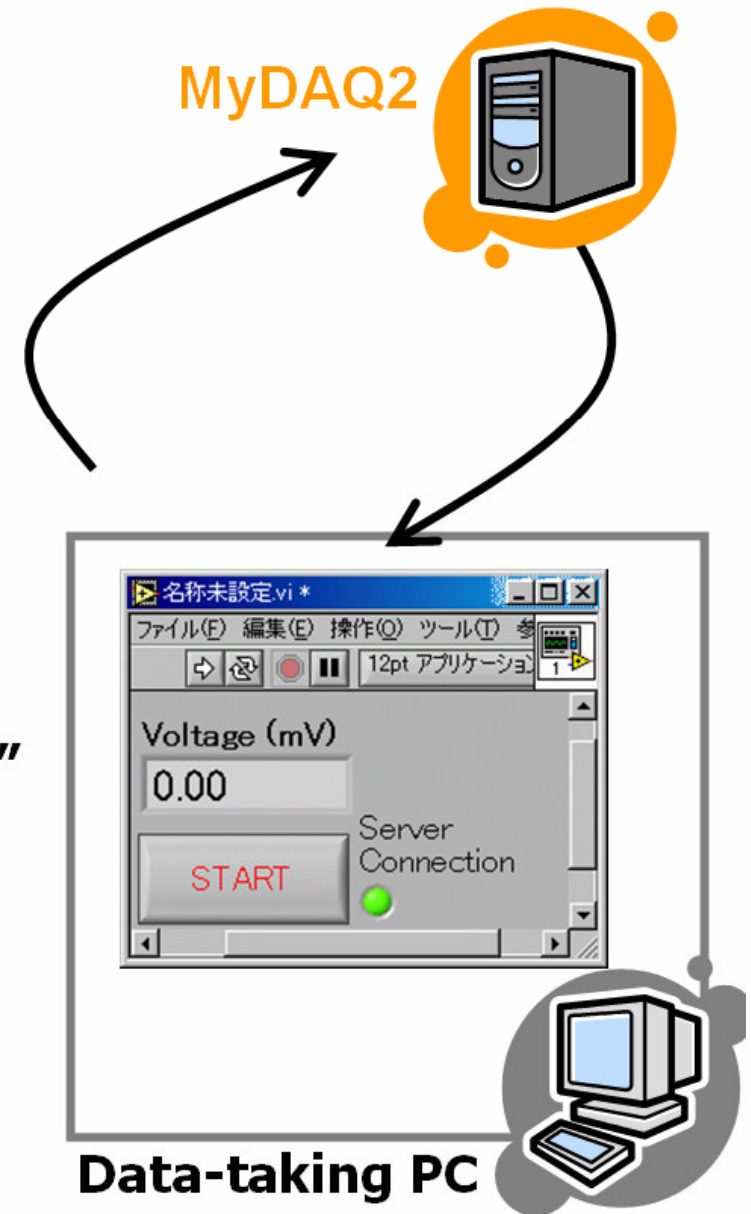
- The protocol of TCP socket communication is in string messages.
- The format of message is

"<command>/<signal name>/<data><CR>"

/ : separators

<CR> : a delimiter

Signal name is named by user



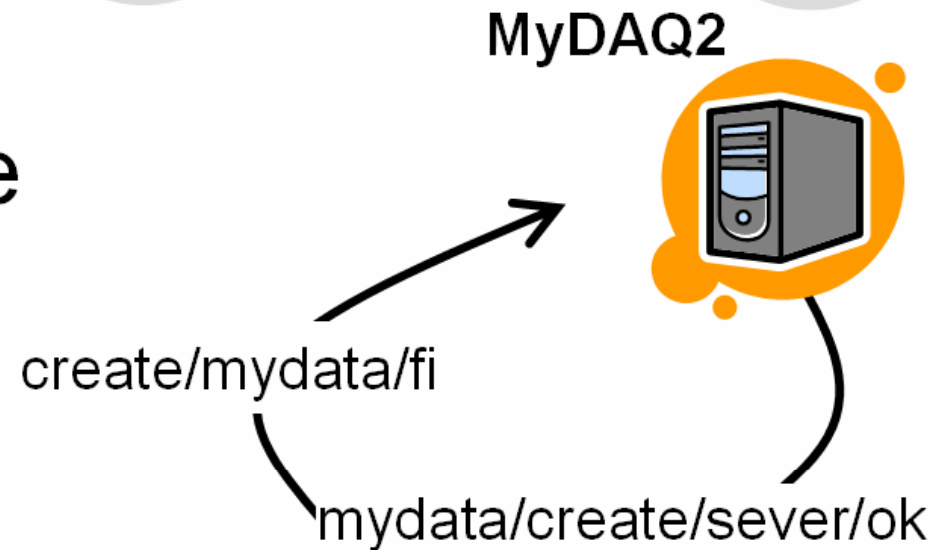
How to use MyDAQ2

Step2. Add TCP socket communication sequence

- Such as...

"create/mydata/fi<CR>"

to ask MyDAQ2 to create a signal "mydata", which has one float and one integer



```
#!/usr/bin/python
import socket

s = socket.socket(socket.AF_INET, s...
s.connect(('my_pc', 10201))

s.send('create/mydata/fi\r')
data = s.recv(1024)

s.close()
```

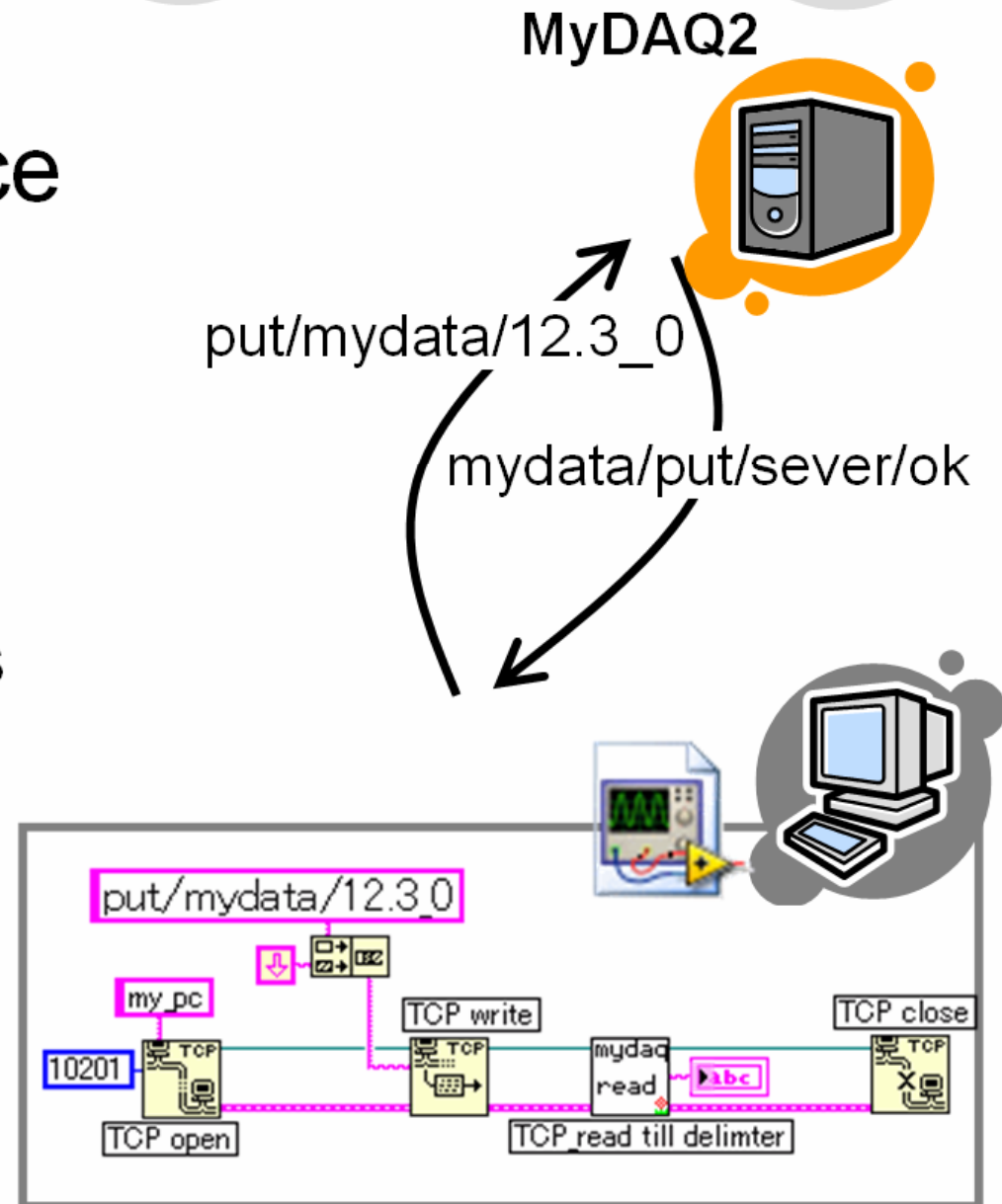
How to use MyDAQ2

Step2. Add TCP socket communication sequence

- Such as..

"**put/mydata/12.3_0<CR>**"

to ask MyDAQ2 to save values of "mydata" as 12.3 and 0



How to use MyDAQ2

Step2. Add TCP socket communication sequence

MyDAQ2



- Any Data-taking program in any language on any OS, which supports TCP socket communication can be a client of MyDAQ2
 - ex. LabVIEW on Windows, C on Linux, JAVA on Solaris
- It is easy to add the client-sequence
 - Because, the protocol is simple

MyDAQ2 is a easy-to-apply system.

How to use MyDAQ2

Step3. Check data on web

- MyDAQ2 automatically creates
 - List of signals with link to time chart

MyDAQ2

Home Index Plot Config Help

Group :

SIGNAL NAME	TIME	COLUMN NAME	VALUE
abc8	2008-10-03 11:47:37.652000	c1	604.0
blo1brt_2005data	2008-06-17 13:19:28.218000	c1	tellms::received message=bl_35in_tc1_sli (13696bite)
blo2bws_2005data		c1	text
mydata	2008-10-10 09:28:26.687000	c1	12.3
		c2	0
a1	2008-09-09 10:26:27.479000	c1	4.0
my_photo		c1	binary
voltage4	2008-10-16 09:51:46.250000	c1	1.2
		c2	2.3
		c3	3.5
		c4	5.6
voltage1		c1	float

How to use MyDAQ2

Step3. Check data on web

- MyDAQ2 automatically creates
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SIGNAL NAME	TIME	COLUMN NAME	VALUE
abc8	2008-10-03 11:47:37.652000	c1	604.0
blo1brt_2005data	2008-06-17 13:19:28.218000	c1	tellms::received message=bl_35in_tc1_sli (13696bite)
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	2008-09-09 10:26:27.479000	c1	4.0
my_photo		c1	binary
voltage4	2008-10-16 09:51:46.250000	c1	1.2
		c2	2.3
		c3	3.5
		c4	5.6
voltage1		c1	float

mydata

2008-10-10
09:28:26.687000

c1

12.3

my_photo

c2

voltage4

Signal name

How to use MyDAQ2

Step3. Check data on web

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MyDAQ2

Home Index Plot Config Help

Group :

SIGNAL NAME	TIME	COLUMN NAME	VALUE
abc8	2008-10-03 11:47:37.652000	c1	604.0
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my_photo		c1	binary
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voltage1		c1	float

mydata

2008-10-10 09:28:26.687000

c1

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voltage4

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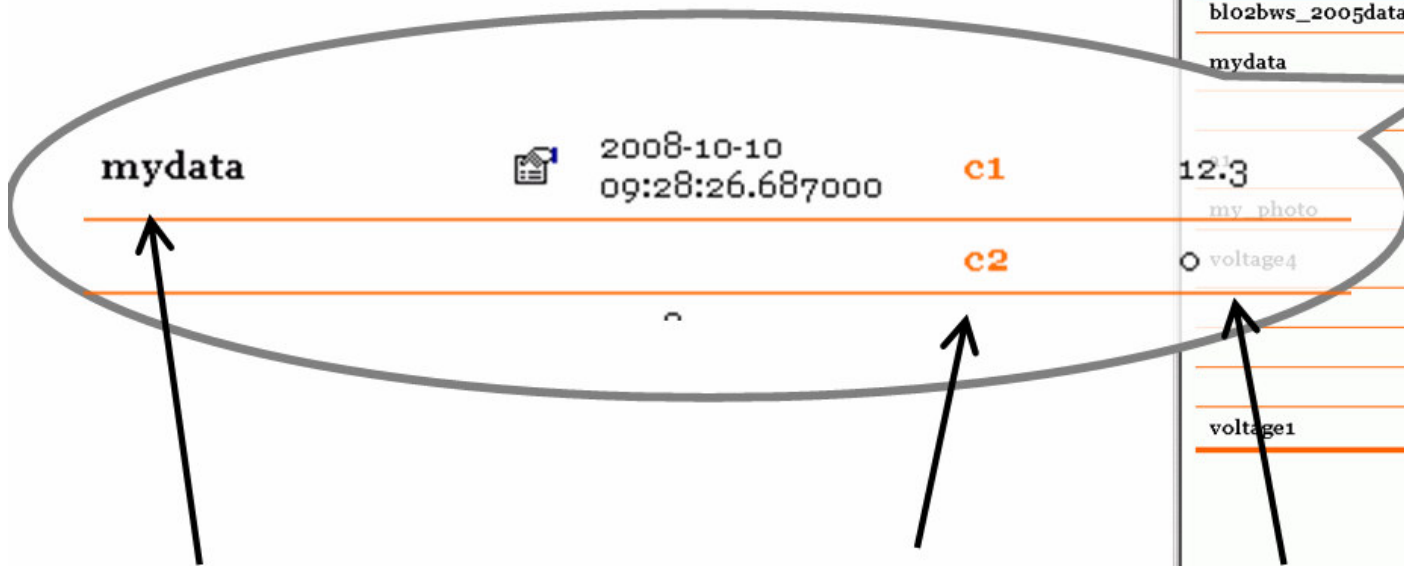
Signal name

Latest Values

How to use MyDAQ2

Step3. Check data on web

- MyDAQ2 automatically creates
 - List of signals with link to time chart



http://localhost/cgi-bin/MyDAQ2/mydaq2_index.py?group_id=8&s=c - Microsoft Internet Explorer

ファイル(E) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H)

アドレス(AD) http://localhost/cgi-bin/MyDAQ2/mydaq2_index.py?group_id=8&s=c 移動

MyDAQ2

Home Index Plot Config Help

Group : test1 Select Group

SIGNAL NAME		TIME	COLUMN NAME	VALUE
abc8		2008-10-03 11:47:37.652000	c1	604.0
blo1brt_2005data		2008-06-17 13:19:28.218000	c1	tellms::received message=bl_35in_tc1_sli (13696bite)
blo2bws_2005data			c1	text
mydata		2008-10-10 09:28:26.687000	c1	12.3
			c2	0
		2008-09-09 10:26:27.479000	c1	4.0
my_photo			c1	binary
		2008-10-16 09:51:46.250000	c1	1.2
			c2	2.3
			c3	3.5
			c4	5.6
voltage1			c1	float

Signal name

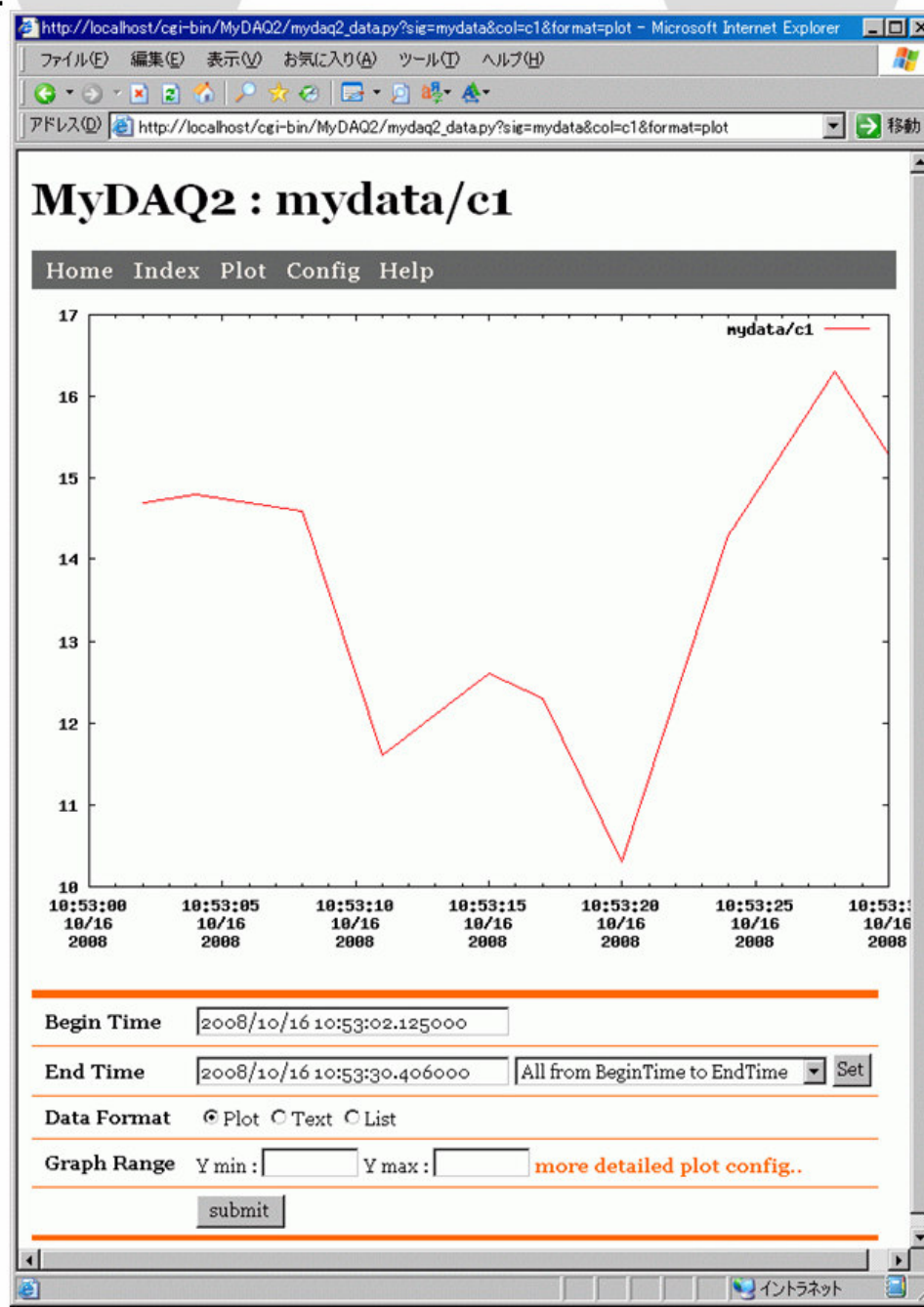
Link to time chart

Latest Values

How to use MyDAQ2

Step3. Check data on web

- MyDAQ2 automatically creates
 - List of signals
 - Time chart



How to use MyDAQ2

Step3. Check data on web

- MyDAQ2 automatically creates
 - List of signals
 - Time chart

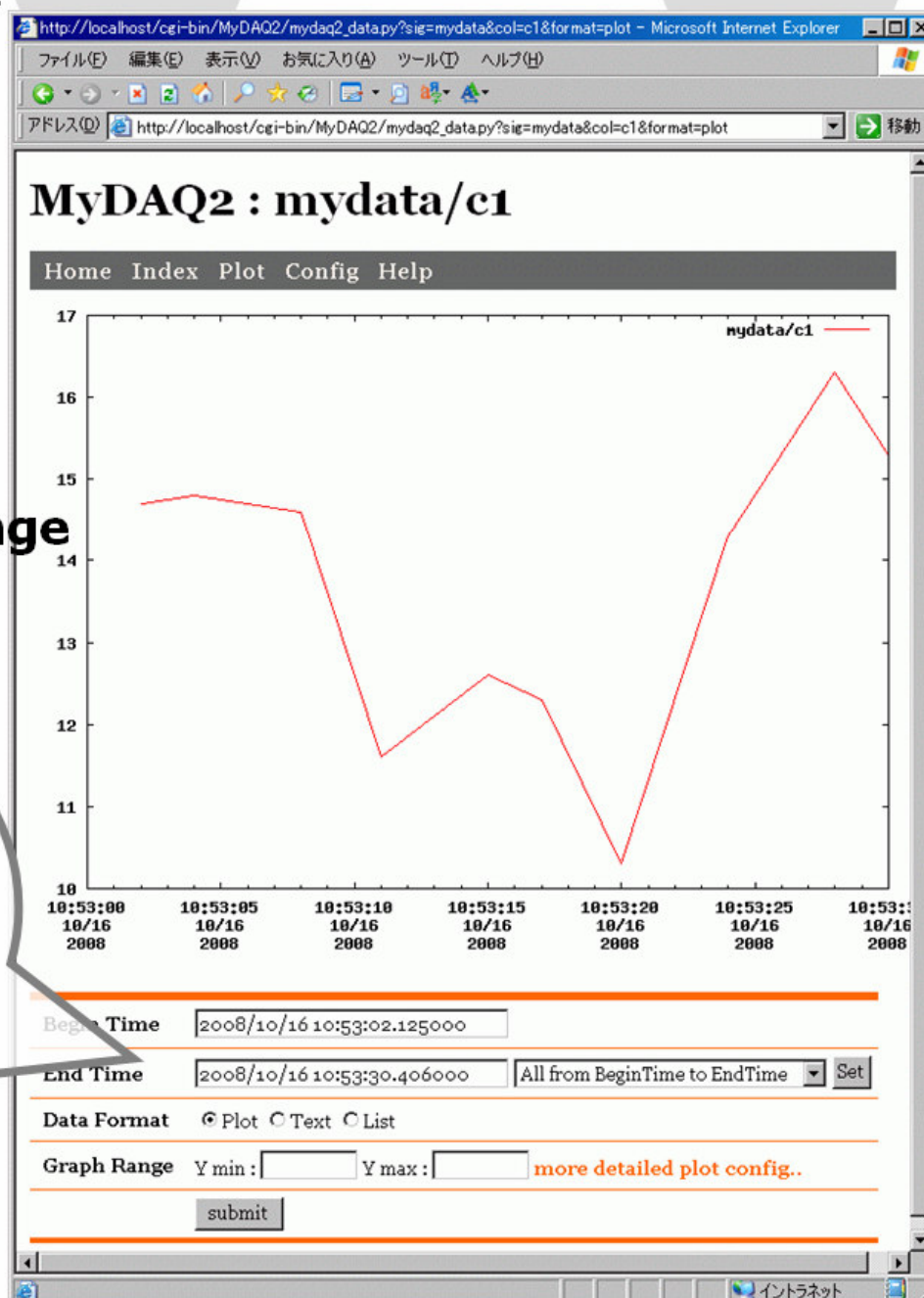
Begin Time 2008/10/16 10:53:02.125000

End Time 2008/10/16 10:53:30.406000

Data Format ☒ Plot ☐ Text ☐ List

Graph Range Y min : Y max :

Time range



How to use MyDAQ2

Step3. Check data on web

- MyDAQ2 automatically creates
 - List of signals
 - Time chart

Begin Time 2008/10/16 10:53:02.125000

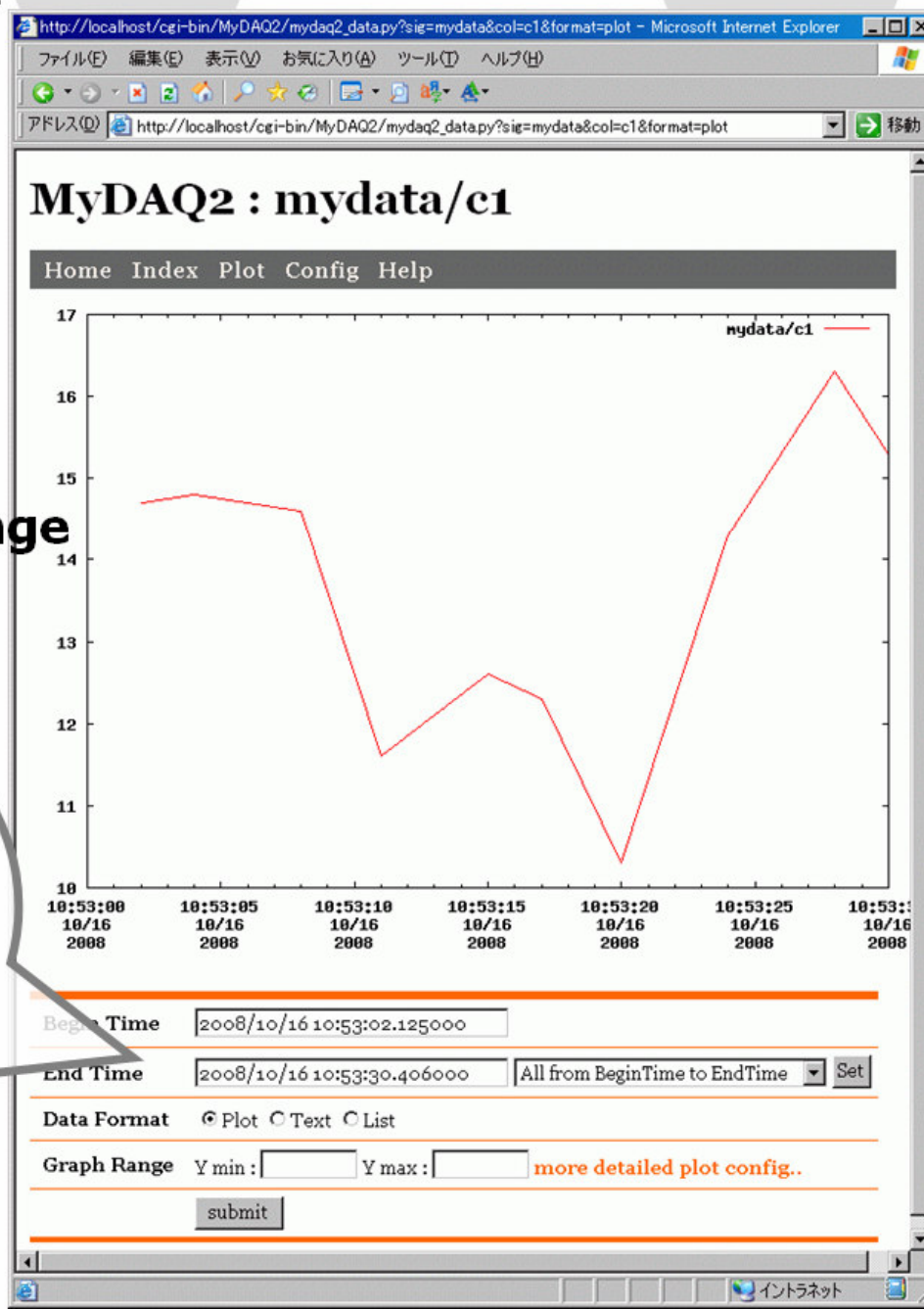
End Time 2008/10/16 10:53:30.406000

Data Format ☒ Plot ☐ Text ☐ List

Graph Range Y min: Y max:

Time range

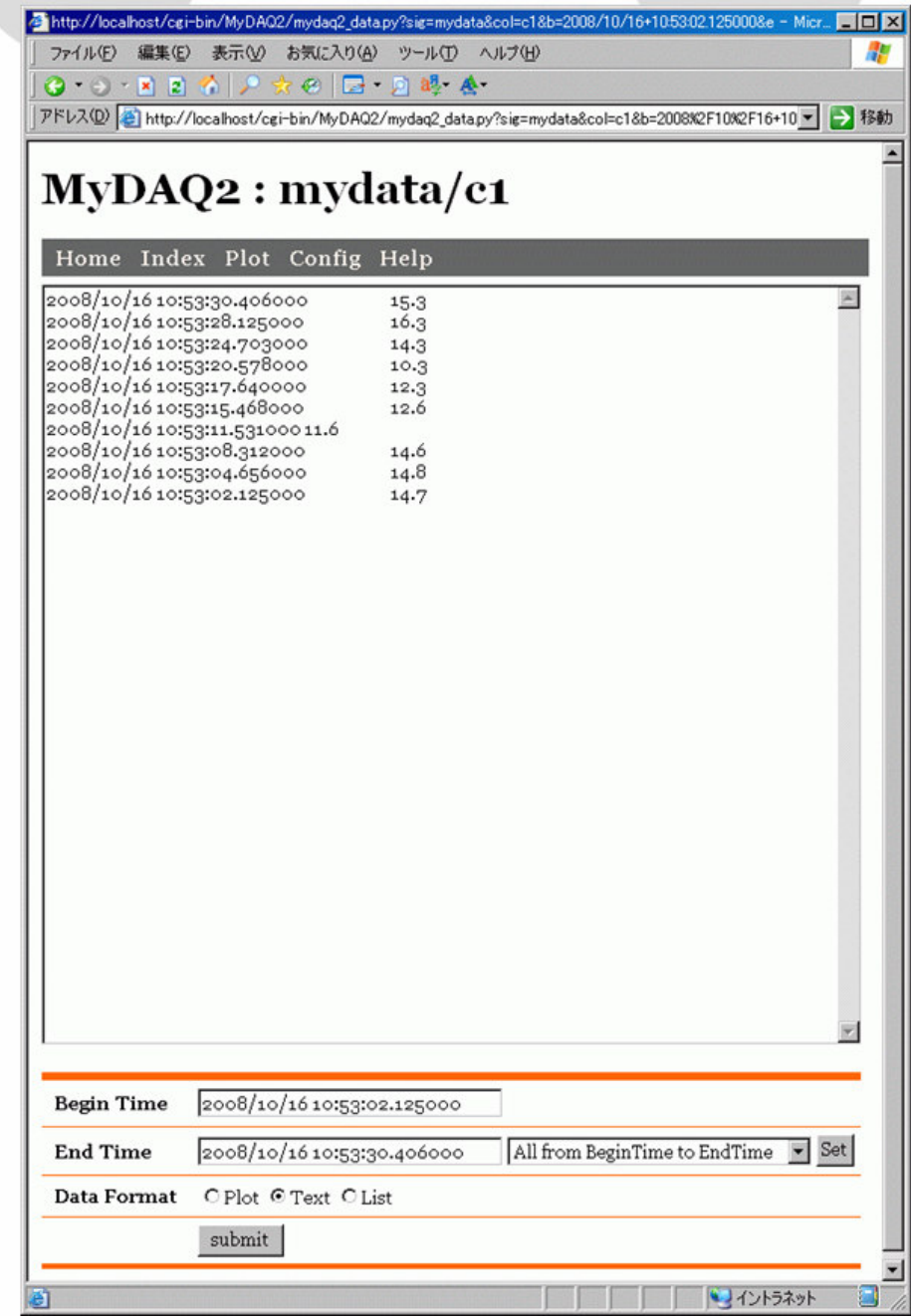
Format of data



How to use MyDAQ2

Step3. Check data on web

- MyDAQ2 automatically creates
 - List of signals
 - Time chart
 - Text

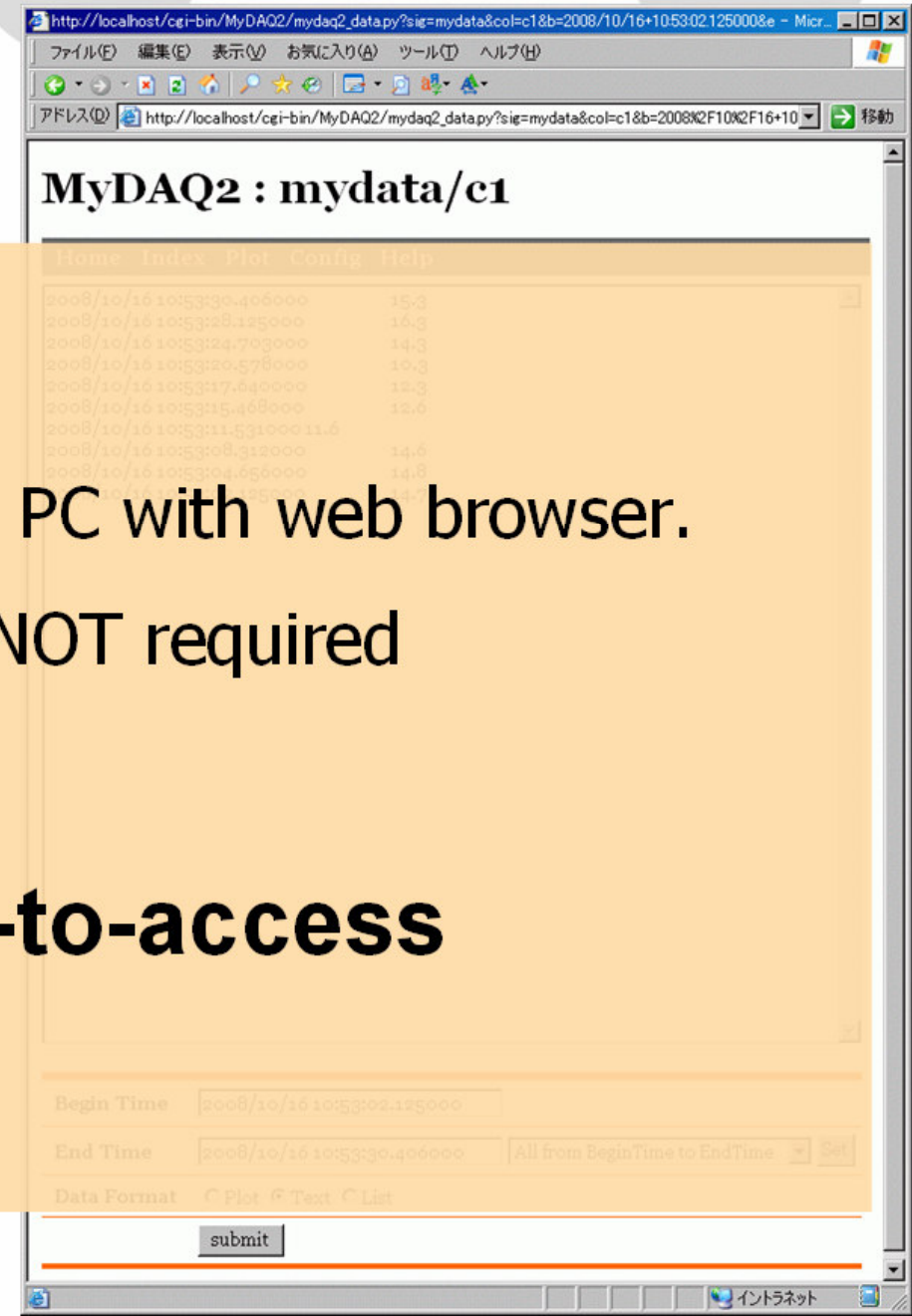


How to use MyDAQ2

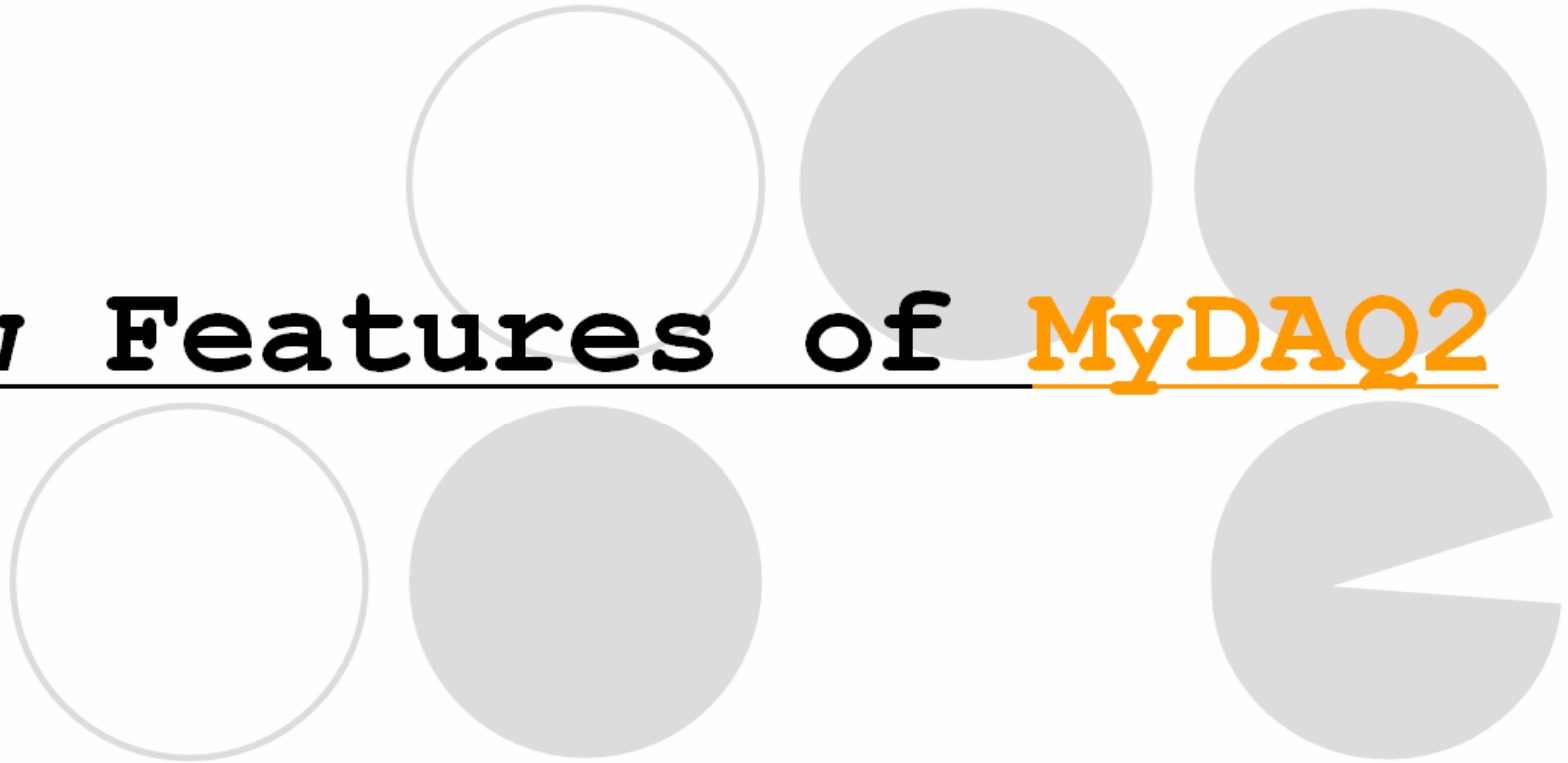
Step3. Check data on web

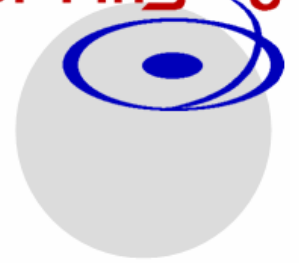
- MyDAQ2 automatically creates
 - List of signals
- The data can be viewed by any PC with web browser.
 - Text

MyDAQ2 is a easy-to-access system.



New Features of MyDAQ2





New features of MyDAQ2

(1. New data-type)

- MyDAQ2 supports binary and text data in addition to float and integer
 - Input Format (TCP socket server)
 - Data is base64-encoded with **MIME** or **character-code** header
 - Binary
 - "**put**/**my_photo**/**image/jpeg**%/9j/4AAQS...<**CR**>"
 - Text
 - "**put**/**my_name**/**UTF8**%5bqD6YeO562J5a2Q<**CR**>"
 - 2-byte characters are supported.
 - Output Format (Http server)
 - Data can be downloaded as a file

New features of MyDAQ2

(2. Asynchronous communication)

- The TCP socket server of MyDAQ2 adopt asynchronous network communication and database access

- MyDAQ2 uses Twisted* as a library of communication

- Twisted also

- shortens development period

- increases stability.

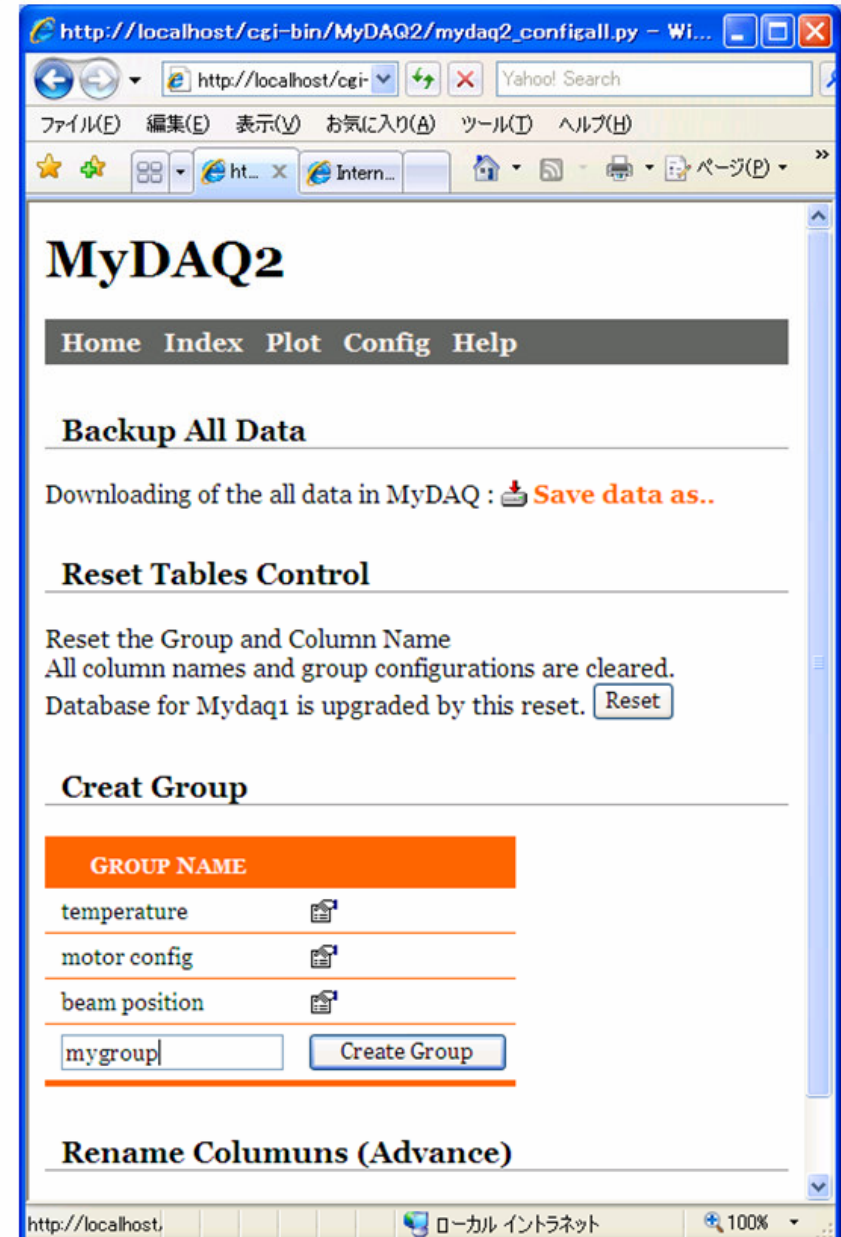
Because, complicated error handlings are already implemented in Twisted.

* <http://twistedmatrix.com/trac/>

New features of MyDAQ2

(3.Data management functions)

- MyDAQ2 is able to “group” the signals
 - For easy access of data on the web.
 - Creation of group and association of signals can be done through the web



New features of MyDAQ2

(3. Data management functions)

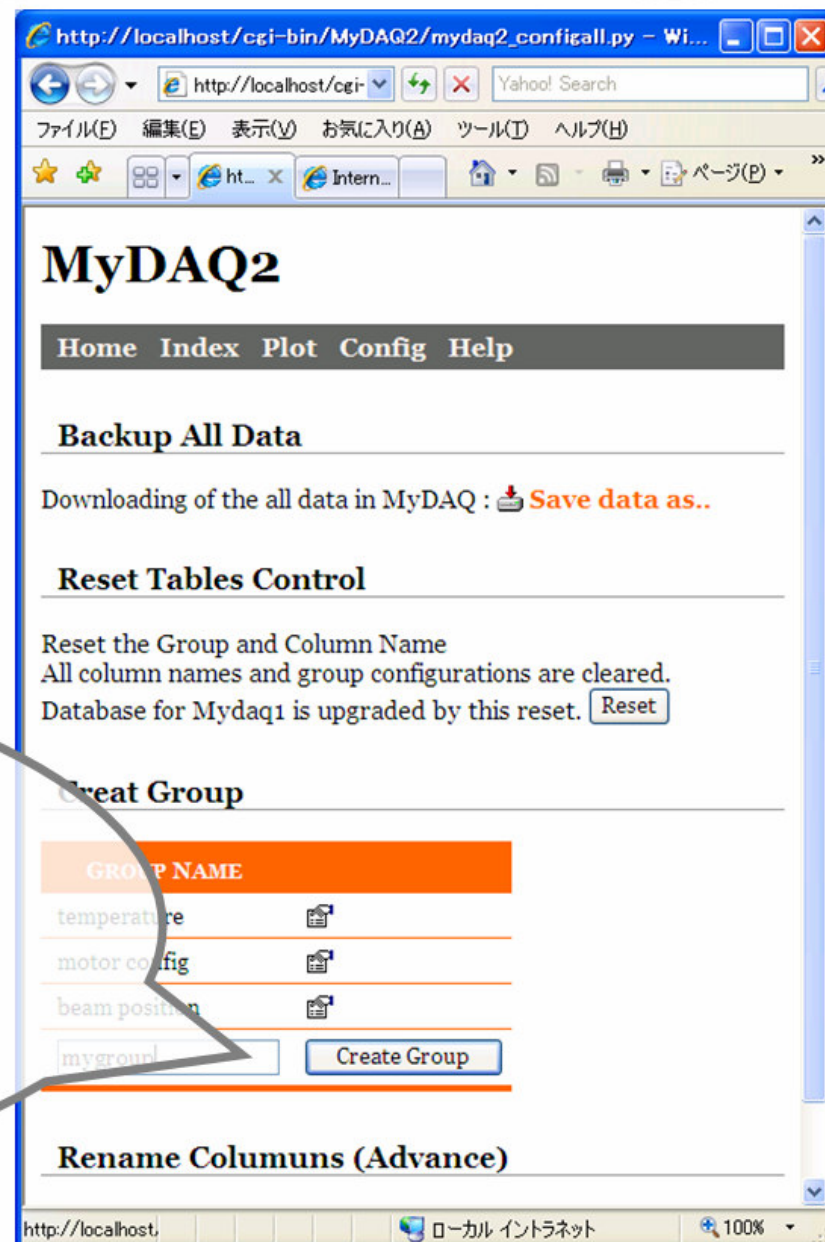
- MyDAQ2 is able to “group” the signals
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 - Creation of group and association of signals can be

beam position



mygroup

Create Group



New features of MyDAQ2

(3. Data management functions)

- MyDAQ2 is able to “group” the signals
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 - Creation of group and association of signals can be done through the web

http://localhost/cgi-bin/MyDAQ2/mydaq2_config.py?sig_id=...

Signal Name : mydata

Rename Signal

mydata :

Drop Signal

Rename Columns

	TYPE	OLD NAME	NEW NAME	
1	float	c1		Rename
2	integer	c2		Rename

Configu

Undefined :

Undefined
temperature
motor config
beam position
mygroup

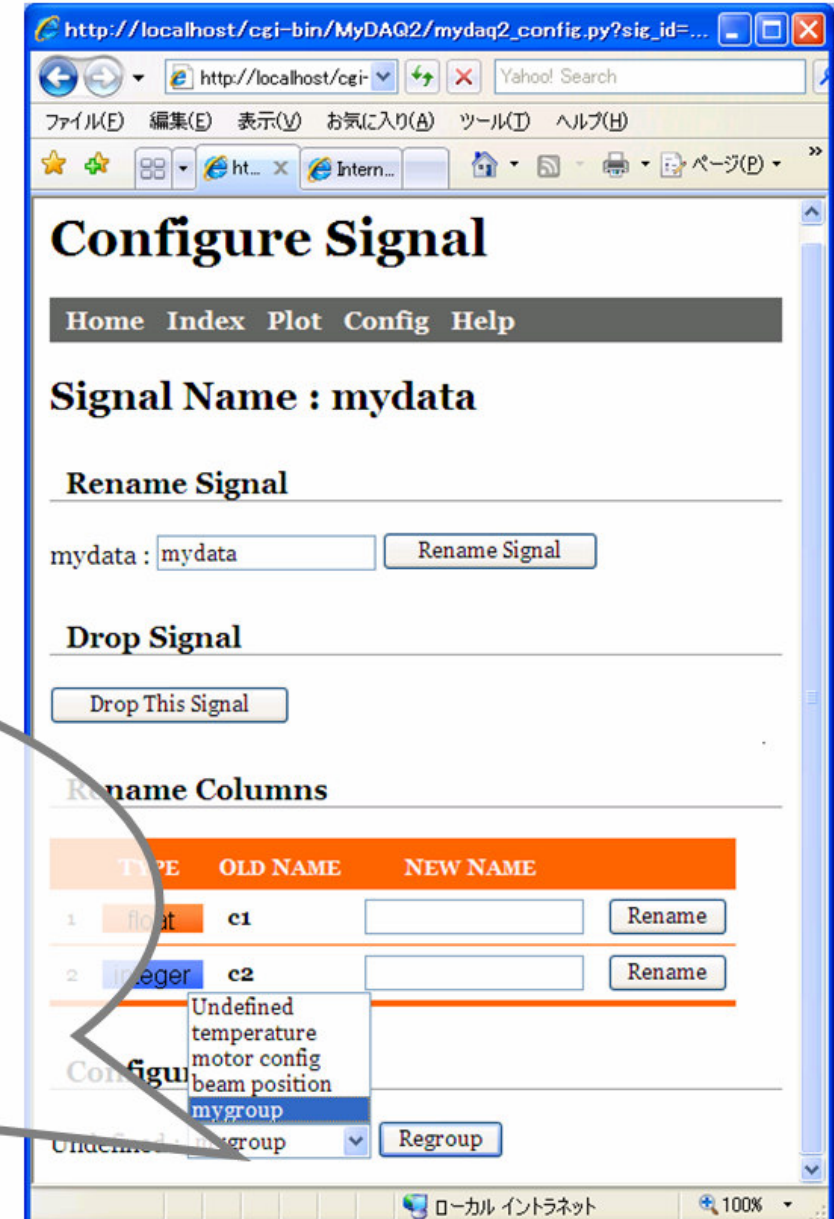
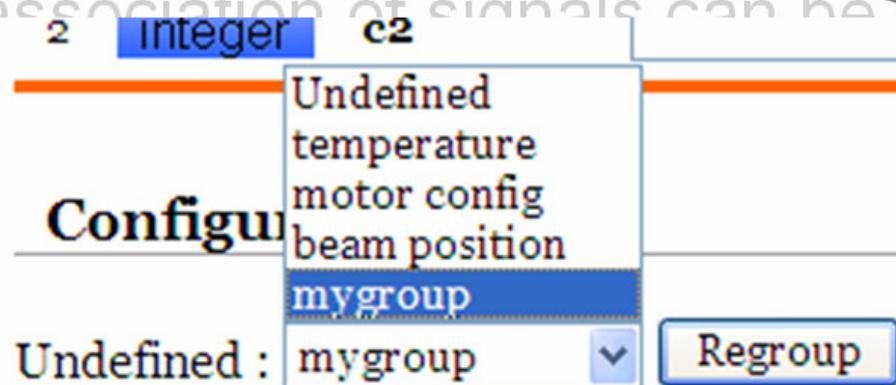
New features of MyDAQ2

(3.Data management functions)

- MyDAQ2 is able to “group” the signals

- For easy access of data on the web.

- Creation of group and association of signals can be



New features of MyDAQ2

(3.Data management functions)

- MyDAQ2 is able to “group” the signals
 - For easy access of data on the web.
 - Creation of group and association of signals can be done through the web

The screenshot shows the MyDAQ2 web interface in a browser window. The URL is `http://localhost/cgi-bin/MyDAQ2/mydaq2_index.py`. The page has a navigation bar with links: Home, Index, Plot, Config, Help. Below the navigation bar, there is a 'Group' dropdown menu set to 'ALL' and a 'Select Group' button. The dropdown menu is open, showing a list of signal groups: 'ALL', 'temperature', 'motor config', 'beam position', and 'mygroup'. Below the dropdown, there is a table of data.

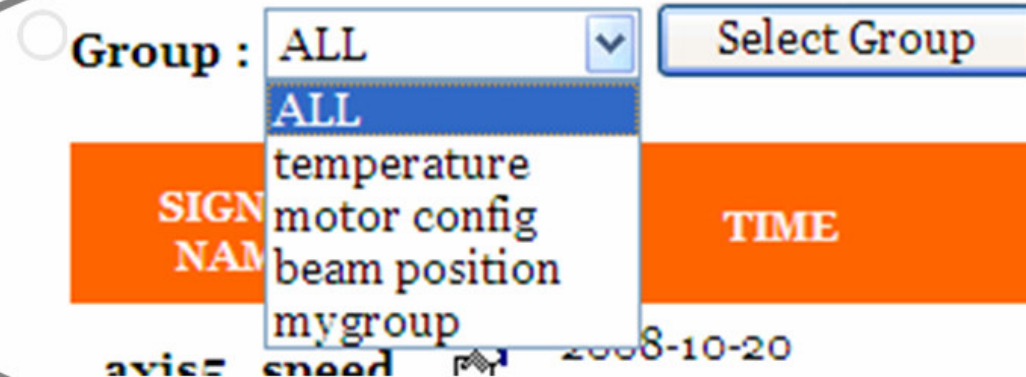
SIGN NAM	TIME	COLUMN NAME	VALUE
axis5_speed	2008-10-20 19:34:49.841000	c1	1000
axis4_speed	2008-10-20 19:34:57.953000	c1	1500
axis3_speed	2008-10-20 19:35:07.777000	c1	11550
axis2_speed	2008-10-20 19:35:11.763000	c1	11550
axis1_speed	2008-10-20 19:35:21.737000	c1	20000
axis4		c1	integer
axis3		c1	integer
axis2		c1	integer
axis1		c1	integer
my_memo		c1	text
mono_3		c1	binary
mono_2		c1	binary

New features of MyDAQ2

(3.Data management functions)

- MyDAQ2 is able to “group” the signals

○ For easy access of data on the web.



MyDAQ2

Home Index Plot Config Help

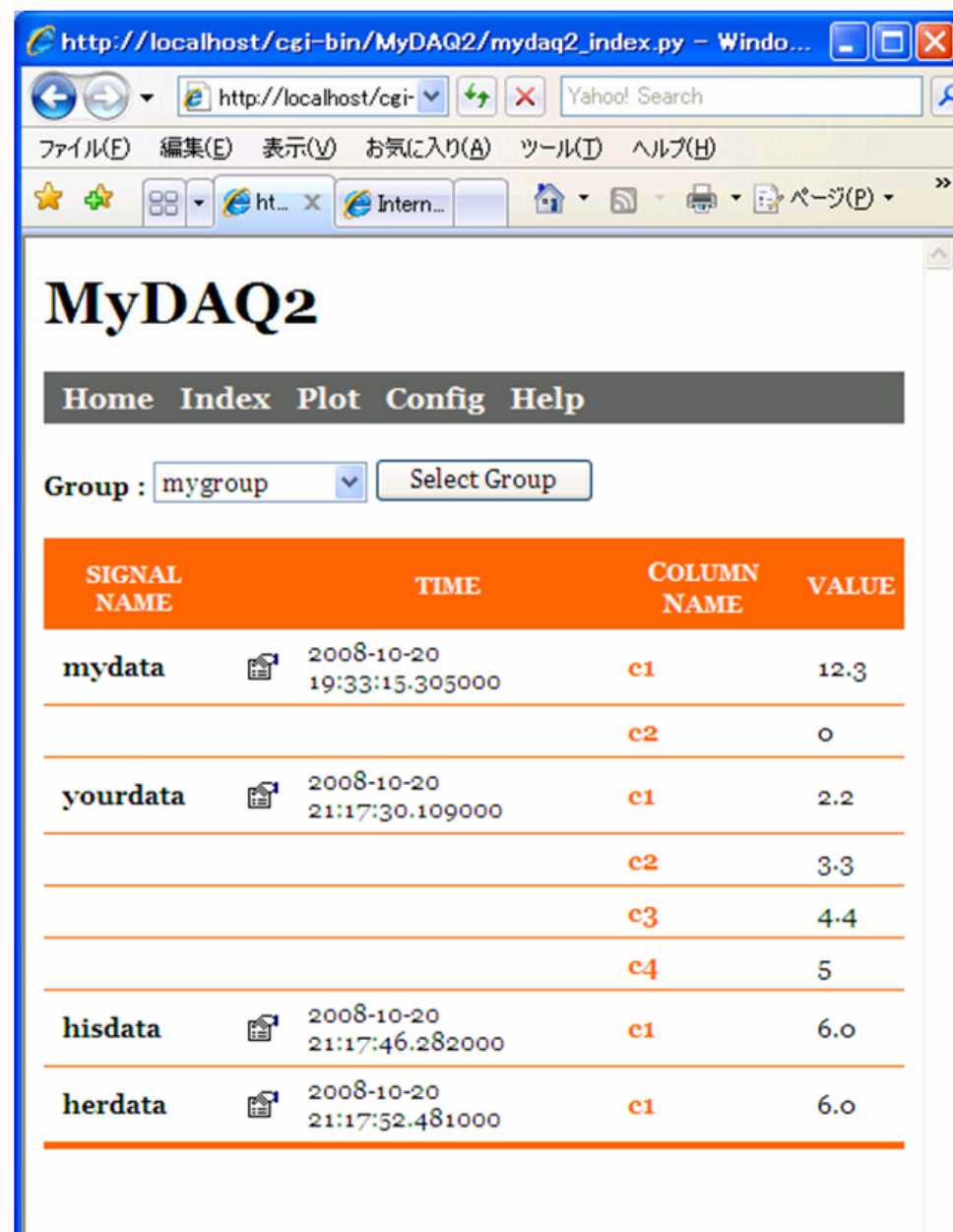
Group : ALL Select Group

SIGN	TIME	COLUMN NAME	VALUE
axis5_speed	2008-10-20 19:34:49.841000	c1	1000
axis4_speed	2008-10-20 19:34:57.953000	c1	1500
axis3_speed	2008-10-20 19:35:07.777000	c1	11550
axis2_speed	2008-10-20 19:35:11.763000	c1	11550
axis1_speed	2008-10-20 19:35:21.737000	c1	20000
axis4		c1	integer
axis3		c1	integer
axis2		c1	integer
axis1		c1	integer
my_memo		c1	text
mono_3		c1	binary
mono_2		c1	binary

New features of MyDAQ2

(3.Data management functions)

- MyDAQ2 is able to “group” the signals
 - For easy access to data on the web.
 - Creation of group and association of signals can be done by the web



The screenshot shows a web browser window with the URL `http://localhost/cgi-bin/MyDAQ2/mydaq2_index.py`. The page title is "MyDAQ2". Below the title is a navigation bar with links: Home, Index, Plot, Config, Help. A "Group" dropdown menu is set to "mygroup", with a "Select Group" button next to it. Below this is a table with four columns: SIGNAL NAME, TIME, COLUMN NAME, and VALUE. The table contains data for three groups: mydata, yourdata, and hisdata, each with multiple rows of data.

SIGNAL NAME	TIME	COLUMN NAME	VALUE
mydata	2008-10-20 19:33:15.305000	c1	12.3
		c2	0
yourdata	2008-10-20 21:17:30.109000	c1	2.2
		c2	3.3
		c3	4.4
		c4	5
hisdata	2008-10-20 21:17:46.282000	c1	6.0
herdata	2008-10-20 21:17:52.481000	c1	6.0

New features of MyDAQ2

(3. Data management functions)

- MyDAQ2 is able to name each data of a signal
 - For “mydata”,
 - First float as “Signal [mV]”
 - Second integer as “Status of Detector”
 - Naming eases the access to data

http://localhost/cgi-bin/MyDAQ2/mydaq2_config.py?sig_id=1...

Yahoo! Search

ファイル(E) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H)

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Configure Signal

Home Index Plot Config Help

Signal Name : mydata

Rename Signal

mydata : mydata

Drop Signal

Rename Columns

	TYPE	OLD NAME	NEW NAME	
1	float	Signal [mV]		Rename
2	integer	c2	Status of Detector	Rename

Configure Group

mygroup : Undefined

ローカル イン트라ネット 100%

New features of MyDAQ2

(3. Data management functions)

- MyDAQ2 is able to name each data of a signal
 - For “mydata”,
 - First float as “Signal [mV]”
 - Second integer as “Status of Detector”

	TYPE	OLD NAME	NEW NAME	
1	float	Signal [mV]		Rename
2	integer	c2	Status of Detector	Rename

Configure Signal

Home Index Plot Config Help

Signal Name : mydata

Rename Signal

mydata :

Drop Signal

Rename Columns

	TYPE	OLD NAME	NEW NAME	
1	float	Signal [mV]		Rename
2	integer	c2	Status of Detector	Rename

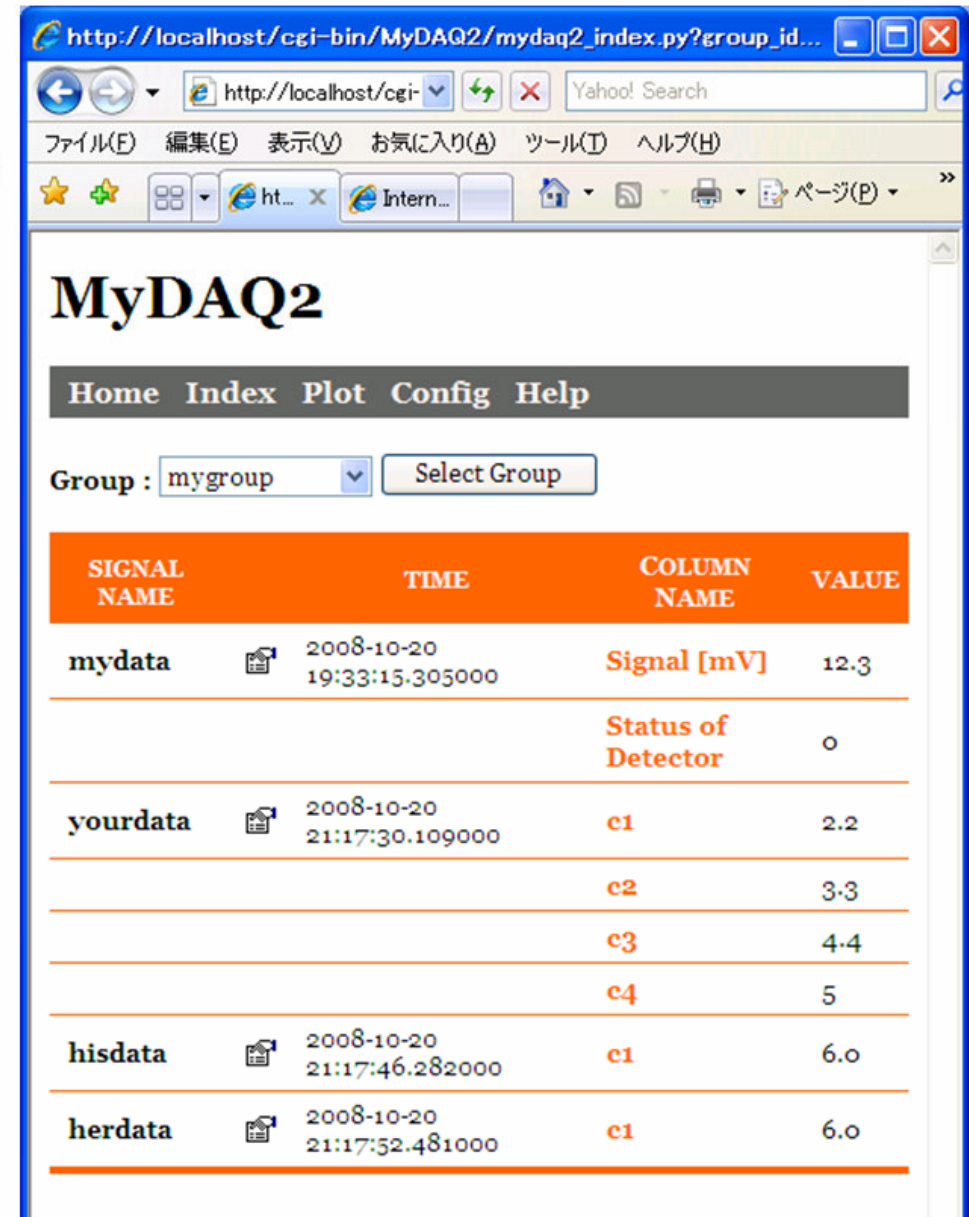
Configure Group

mygroup :

New features of MyDAQ2

(3. Data management functions)

- MyDAQ2 is able to name each data of a signal
 - For “mydata”,
 - First float as “Voltage [mV]”
 - Second integer as “Status of voltmeter.”
 - Naming eases the access to data



The screenshot shows the MyDAQ2 web interface in a browser window. The URL is `http://localhost/cgi-bin/MyDAQ2/mydaq2_index.py?group_id...`. The page has a navigation bar with links: Home, Index, Plot, Config, Help. Below the navigation bar, there is a "Group:" dropdown menu set to "mygroup" and a "Select Group" button. The main content area displays a table with the following data:

SIGNAL NAME	TIME	COLUMN NAME	VALUE
mydata	2008-10-20 19:33:15.305000	Signal [mV]	12.3
		Status of Detector	0
yourdata	2008-10-20 21:17:30.109000	c1	2.2
		c2	3.3
		c3	4.4
		c4	5
hisdata	2008-10-20 21:17:46.282000	c1	6.0
herdata	2008-10-20 21:17:52.481000	c1	6.0

New features of MyDAQ2

(4. Various data viewers)

- MyDAQ2 has user-friendly viewers
 - Images on signal list

The screenshot shows the MyDAQ2 web interface in a browser window. The address bar shows `http://localhost/cgi-bin/mydaq2_index.py`. The page title is "MyDAQ2". Below the title are links: [Home] [View Data List] [Config] [Help]. There is a "Group" dropdown menu set to "ALL" and a "Select Group" button. A table displays the data list with columns: SIGNAL NAME, TIME, COLUMN NAME, and VALUE.

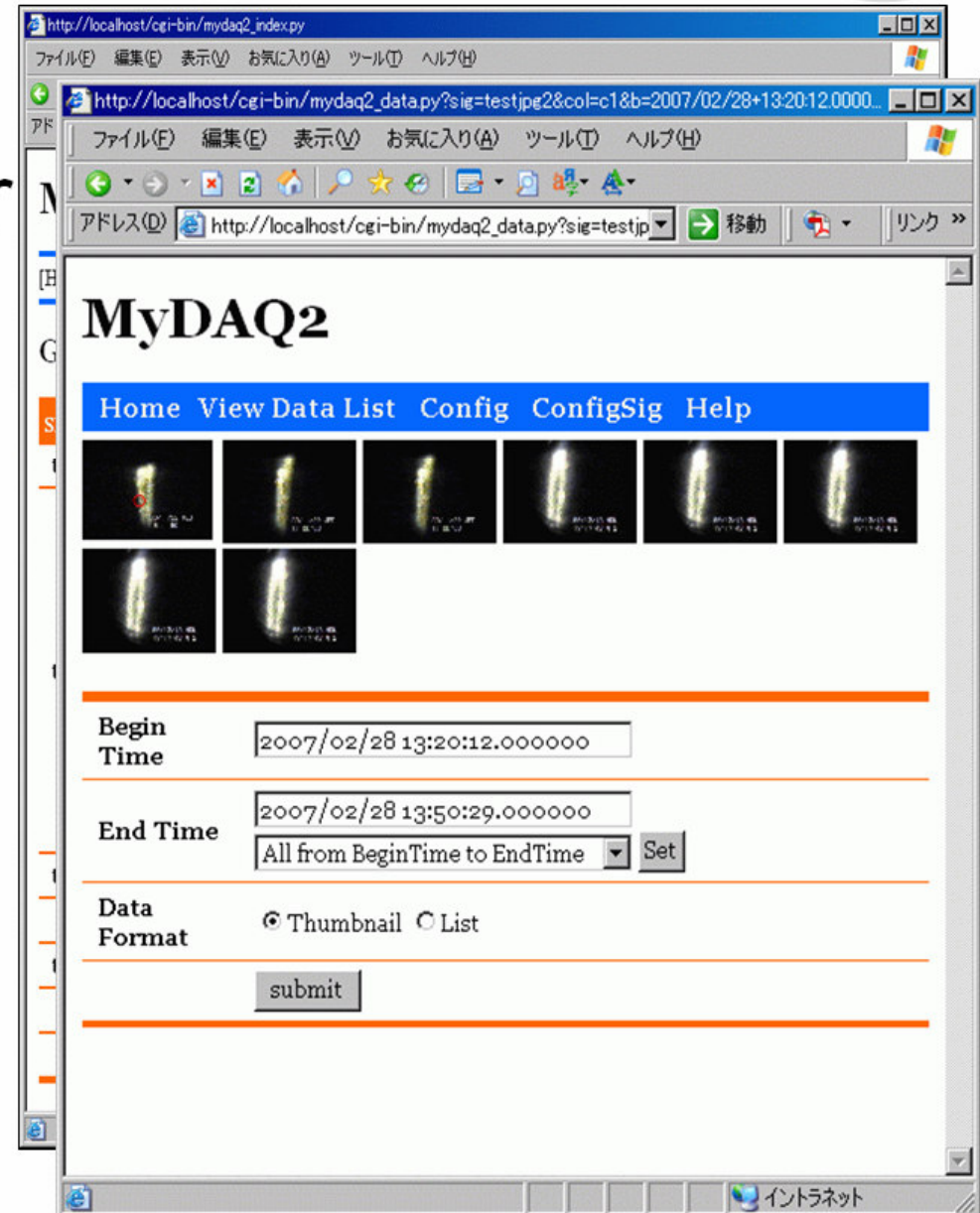
SIGNAL NAME	TIME	COLUMN NAME	VALUE
test2	1970-01-01 09:01:41.50	output voltage	6.0
testjpg2	2006-06-28 18:38:58.0	picture	
test	2006-06-28 16:59:32.0	Axis(pls)	2.0
		Current(A)	20
today3	2006-10-19 15:55:31.0	c1	5
		c2	3
		c3	4.0

The browser's status bar at the bottom shows "イントラネット".

New features of MyDAQ2

(4. Various data viewer)

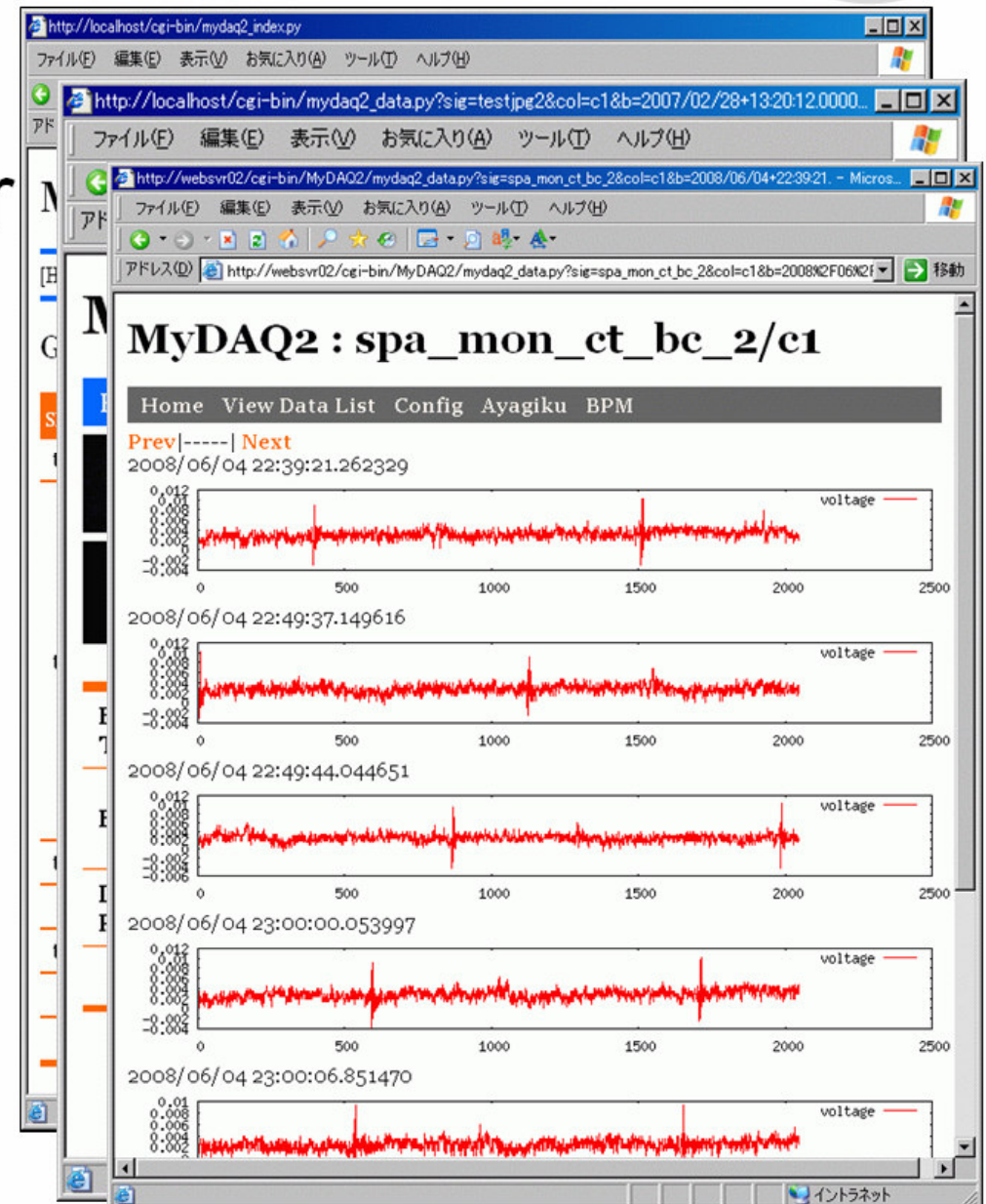
- MyDAQ2 has a viewer of...
 - Images
 - Thumbnail of images



New features of MyDAQ2

(4. Various data viewer)

- MyDAQ2 has a viewer of...
 - Images
 - Thumbnail of images
 - Spectrums



New features of MyDAQ2

(4. Various data viewers)

- MyDAQ2 has a viewer of...

- Images
- Thumbnail of images
- Spectrums
- Custom-made report
- ...

But,
we cannot make all viewer users want

MyDAQ2 : bl01brt_2005data

Date : 2008/09/08 09:03:32.620201

Comment

no comment

MOTER SETTING: BL_01B1_FE_AF

AXIS	POSITION	SPEED	MODE	RISE	FALL	BACKLASH
y	33058pulse	800pps	--	300ms	300ms	--

MOTER SETTING: BL_01B1_FE_GF

AXIS	POSITION	SPEED	MODE	RISE	FALL	BACKLASH
y	29000pulse	1000pps	--	300ms	300ms	--

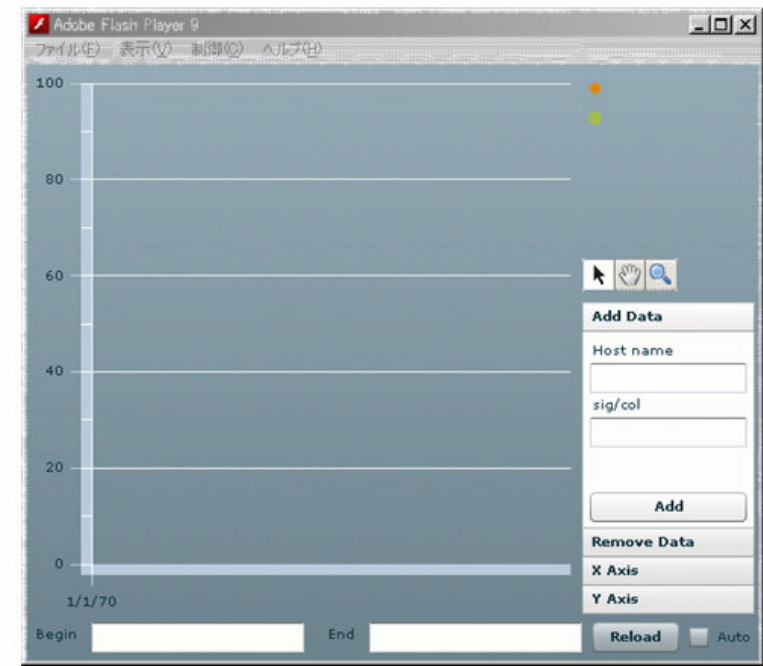
MOTER SETTING: BL_01B1_FE_XB

AXIS	POSITION	SPEED	MODE	RISE	FALL	BACKLASH
y	-37500pulse	5000pps	--	300ms	300ms	--
x	-500pulse	500pps	--	1000ms	1000ms	--

New features of MyDAQ2

(5. Open interface for viewer)

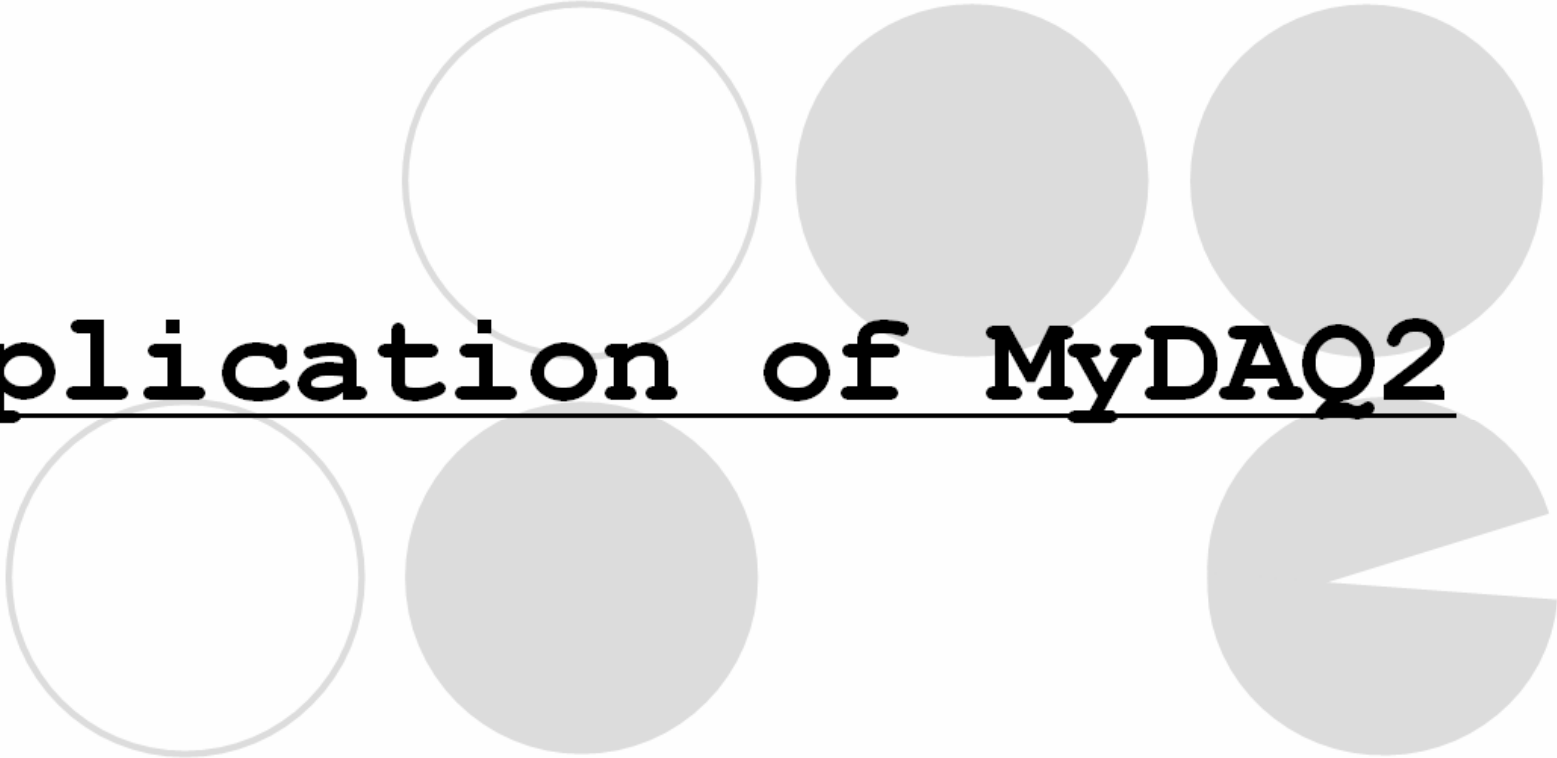
- MyDAQ2 has an open interface for custom application.
 - XML-RPC interface that provide data in XML format.
- User can make customized viewer not only web viewer but stand-alone applications.
- A viewer showing data from several MyDAQ2s is also available.



New features of MyDAQ2 (6. Installer)

- MyDAQ2 has its installer
 - The installer setups
 - CGIs and TCP socket server
 - Management tables and an account of relational database
 - A single command to install
 - “python setup.py install”

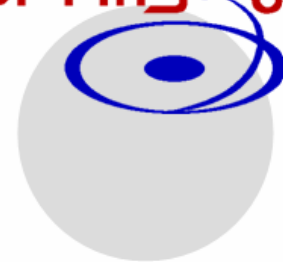
Application of MyDAQ2

The background features a decorative arrangement of circles and a Pac-Man character. In the top row, there is one white circle with a gray outline, followed by two solid gray circles. In the bottom row, there is one white circle with a gray outline, followed by one solid gray circle, and then a gray Pac-Man character facing right.

Application of MyDAQ2

- SPring-8 has 50~ beamlines
- Each beamline has 1-4 stations for experiments.
- A small group (1-4 staffs) runs 1-4 experiment-stations
- Some of groups want to log data from their experiment-station.
 - They does not share their data with other group

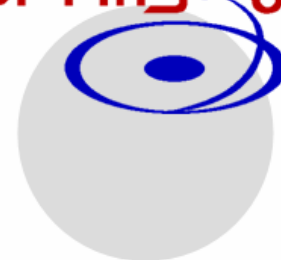
➡ Many MyDAQ2 was/will be introduced



Application of MyDAQ2

We have installed....

MyDAQ2 (Server)		Data-taking PC (Client)		Usage, # of data
OS	Hard Ware	OS	Language	
Red Hat	Desk-top PC	Windows XP	LabVIEW	Temperature monitor (200 floats from voltmeter)
Cent OS	Server (SunfireX4200)	Solaris on VME	C	Spectrum from taken by ADC (1024 floats/wave)
Windows XP	Desk-top PC w/ Pentium4 2.4GHz	Windows 2000	Visual C++	
		Windows XP	LabVIEW	
Ubuntsu	Virtualized Host on blade server (HP bl460c)	Ubuntsu	C with MADOCA	Mirror position (2 floats)
		SUSE	Python	Configuration of PMC (16K text x 50)
Red-Hat	Server (HP ProLiant)	Scientific Linux	Python with EPICS	Wave form, float points



Application of MyDAQ2

MyDAQ2 (Server)		Data-taking PC (Client)		Usage, # of data
OS	Hard Ware	OS	Language	
Vine	Desk-top PC	Debian on CompactPCI	C	Beam Intensity Monitor (1float 0.1Hz)
Ubuntsu	Virturalized Host on blade server (HP bl460c)	Windows XP	LabVIEW	Temperature monitor (200 floats from voltmeter)
Macintosh	Desk-top PC	Debian on PC104	C	Evaluation of ADC board (2-3 floats)
		⋮		.

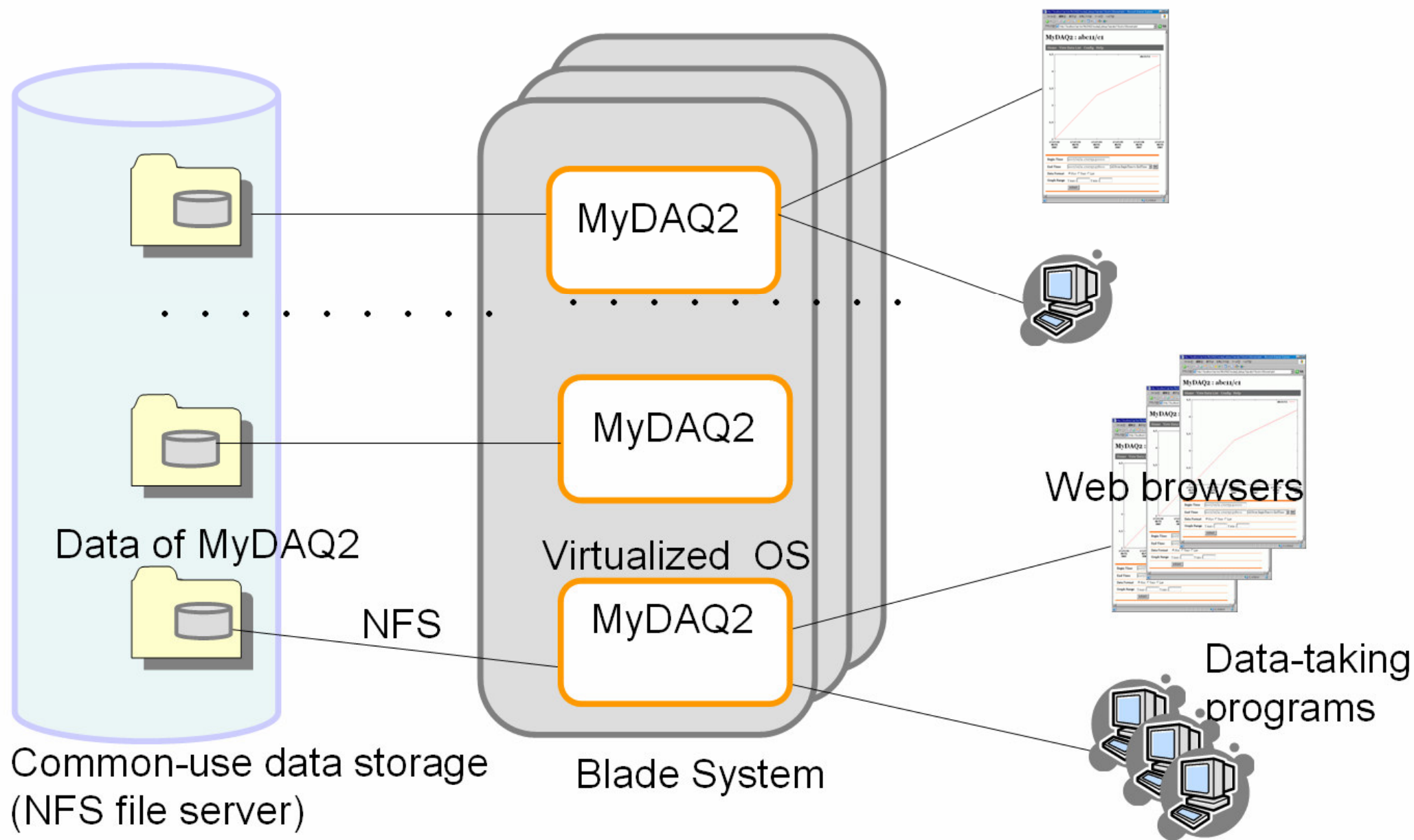
**Users (beamline staffs) do not want to maintain MyDAQ2,
Too many for Control Gr. to maintain.**

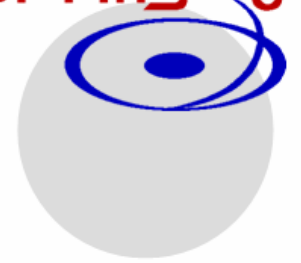
- **Data Backup**
- **Updating (bug-fix) of MyDAQ2**

Application of MyDAQ2 (Data storage system in SPring-8)

- We designed a new storage system with MyDAQ2
 - MyDAQ2 will be used by many data acquisition systems, which basically each of them do not share data each other.
 - Multiple and “separated” MyDAQ2s
 - MyDAQ2 will be used as a part of rather small (~1000 signals) data acquisition system by a small group.
 - Low-performance (speed of CPU, memory size,,,) but reliable machine
 - User of MyDAQ2 dose not want to do maintenance of the system.
 - Easy maintenance which can be done by Control Gr.

Application of MyDAQ2 (Data storage system in Spring-8)





Application system MyDAQ2

- Each user uses their MyDAQ2
 - Data belongs to other group would not be mixed. It in other MyDAQ2, that is in other OS.
- This architecture provides several MyDAQ2s on one blade server.
 - We can provide MyDAQ2 on user's demand by adding a virtualized OS.
- Data can be backed up by taking snapshot of the data storage. MyDAQ2 will be upgraded by updating the images of virtualized OS
 - User of MyDAQ will not be bothered by maintenance of MyDAQ2

We will operate this system, soon.

Conclusion

- We successfully upgraded MyDAQ to MyDAQ2.
 - MyDAQ2, as same as MyDAQ, has a TCP socket input interface and data browser on the web
 - MyDAQ2 worked well as expected
- MyDAQ2 was applied to the variety of data acquisition systems.
- We will provide MyDAQ2 as one of interface of common-use data storage in SPring-8.