

## Abstract :

MADDOCA-to-EPICS gateway has been developed for easy and rapid integration of EPICS-ready devices into MADDOCA, the control software framework for SPRING-8 and SACLA. MADDOCA uses equipment control software called Equipment Manager (EM) in the device control layer. The MADDOCA-to-EPICS gateway is implemented as a general-purpose EM to handle EPICS IOCs. The gateway consists of EM functions that interact with IOCs using Channel Access (CA) protocol corresponding to EPICS commands such as caget, caput and camonitor. We can build the gateway for the target EPICS device by editing the EM configuration file,

without any programming.

We have applied the gateway to the Libera Brilliance+ installed in the SPRING-8 storage ring, to be evaluated towards the SPRING-8 upgrade project. In addition, it has been applied to the Libera Brilliance Single Pass and Spark (installed in beam transport line), and the Libera Spark and Cavity (installed in SACLA). The gateway is helpful in minimizing the installation time and effort even for the different platform (CPU and OS) devices. We will report on the development and advantage as well as the performance improvement of the MADDOCA-to-EPICS gateway.

## Development of MADDOCA-to-EPICS Gateway

### Purpose

- Easy and rapid integration of EPICS-ready device into MADDOCA.

### Design Policy

- General-purpose EM functions based on EPICS CA protocol.
- Built the gateway EM by editing the configuration file without any programming.

### Development

- EM functions corresponding EPICS caput/caget/camonitor.
  - pull-type data collection from host computer
- Avoid overhead problem of CA access by storing connection status.
  - first time : 30 ms/record → second and later 1 ms
  - 10Hz data collection with 1000 signals

### MADDOCA : Message And Database Oriented Control Architecture

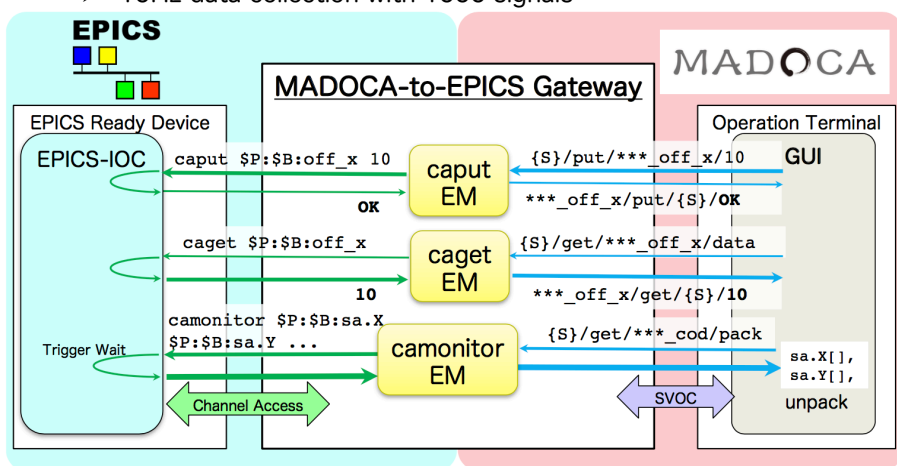
- Message-driven client-server model control framework
- Standard control system at SPRING-8 and SACLA

### EPICS : Experimental Physics and Industrial Control System

- Client-server model and publish-subscribe model
- Use at many accelerator facilities

### Prototype of extended Gateway for faster data collection

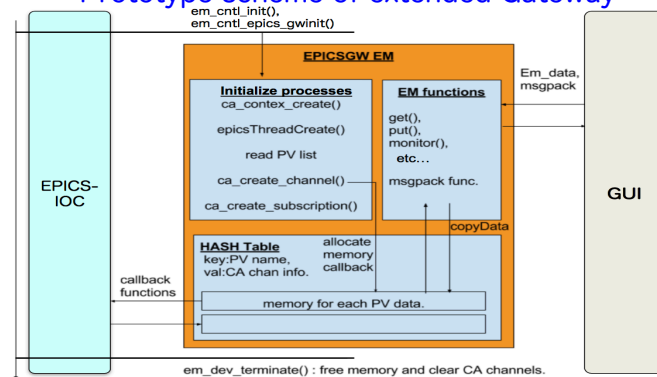
- EPICS can distribute data from IOC by pub-sub → speed enhancement
  - CA operation replace by callbacks and subscriptions.
  - Store PV data in ring buffer memory
- Asynchronous data collection using callbacks function
  - Example) Buffering data at 60Hz trigger period by 60 times, and read 1Hz.
  - Readout test using simulator : Achieved 10000-elements array data collection at 50Hz.



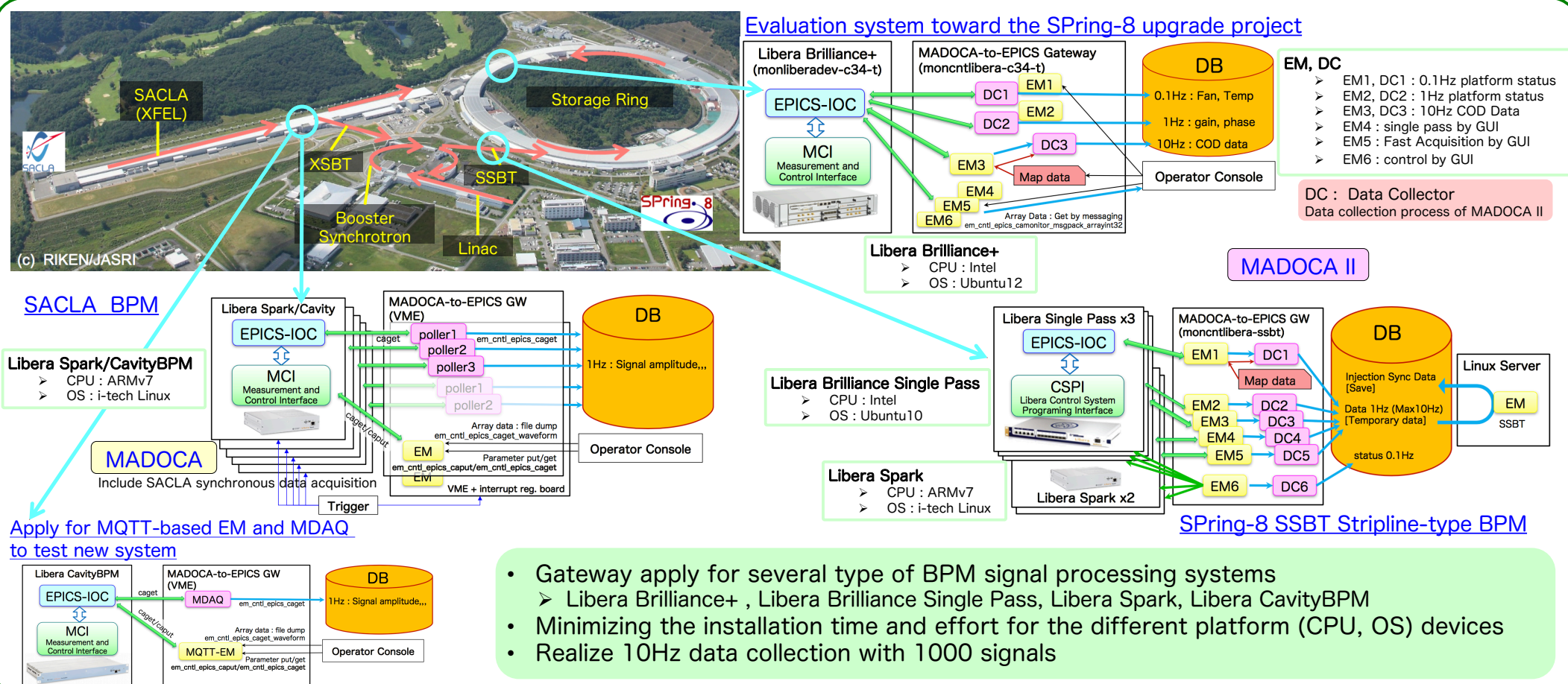
### Example of EM configuration file

```
put/ar_mon_libera_1_off_x
  id      em_cntl_epics_caput_int  sr_mon_libera_1_bpm1_off_x  1.0
  none
  em_std_ret      EPICS-EM function  EPICS PV name  Timeout
get/ar_mon_libera_1_off_x
  data      em_cntl_epics_caget  sr_mon_libera_1_bpm1_off_x  1.0
  none
  em_cntl_epics_ret_string
get/ar_mon_libera_1_tbt_adc_mask
  pack      em_cntl_epics_caget_msgpack_arrayint32  sr_mon_libera_1_tbt_adc_mask  1.0
  none
  em_cntl_epics_ret_string
get/ar_mon_libera_1_cod
  pack      em_cntl_epics_camonitor_msgpack_arrayint32  pvlist_cod.txt  1.0  (0.01)  (1)
  none
  em_cntl_epics_ret_string
  EPICS PV list
  sr_mon_libera_1_bpm1:sa.X
  sr_mon_libera_1_bpm1:sa.Y
  sr_mon_libera_1_bpm1:sa.Sum
```

### Prototype scheme of extended Gateway



## Applications



## Conclusion :

- EPICS-ready devices can be integrated easily and rapidly in MADDOCA.
- Solved the overhead problem of CA access by storing connection status and realized 10Hz data collection with 1000 signals.
- We applied control and data collection to eleven BPM signal processing system, Libera, installed on SPRING-8 and SACLA.

- We achieved installation with minimum time and effort for three different platforms.
- We successfully created a prototype of asynchronous data collection for speed enhancement such as collecting 10000 array data at 50Hz.