

# CWB

## Network Information exChange Environment (NICE)



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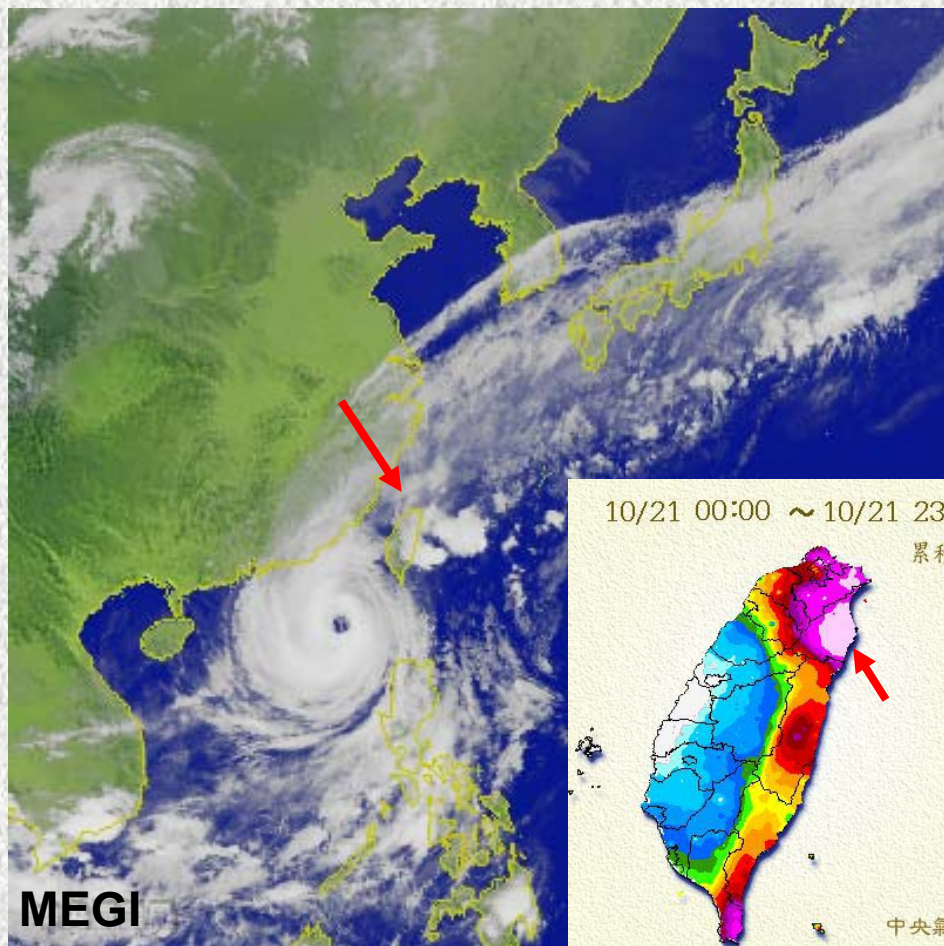
# NICE

## A network based application framework for real time distributed data processing

1. Roles and Responsibilities of CWB
2. Meteorological data processing requirements
3. HW environment and application systems
4. NICE requirement and components
5. Operation concepts
6. Real world applications and future

# Key issues to TW weather forecast challenge

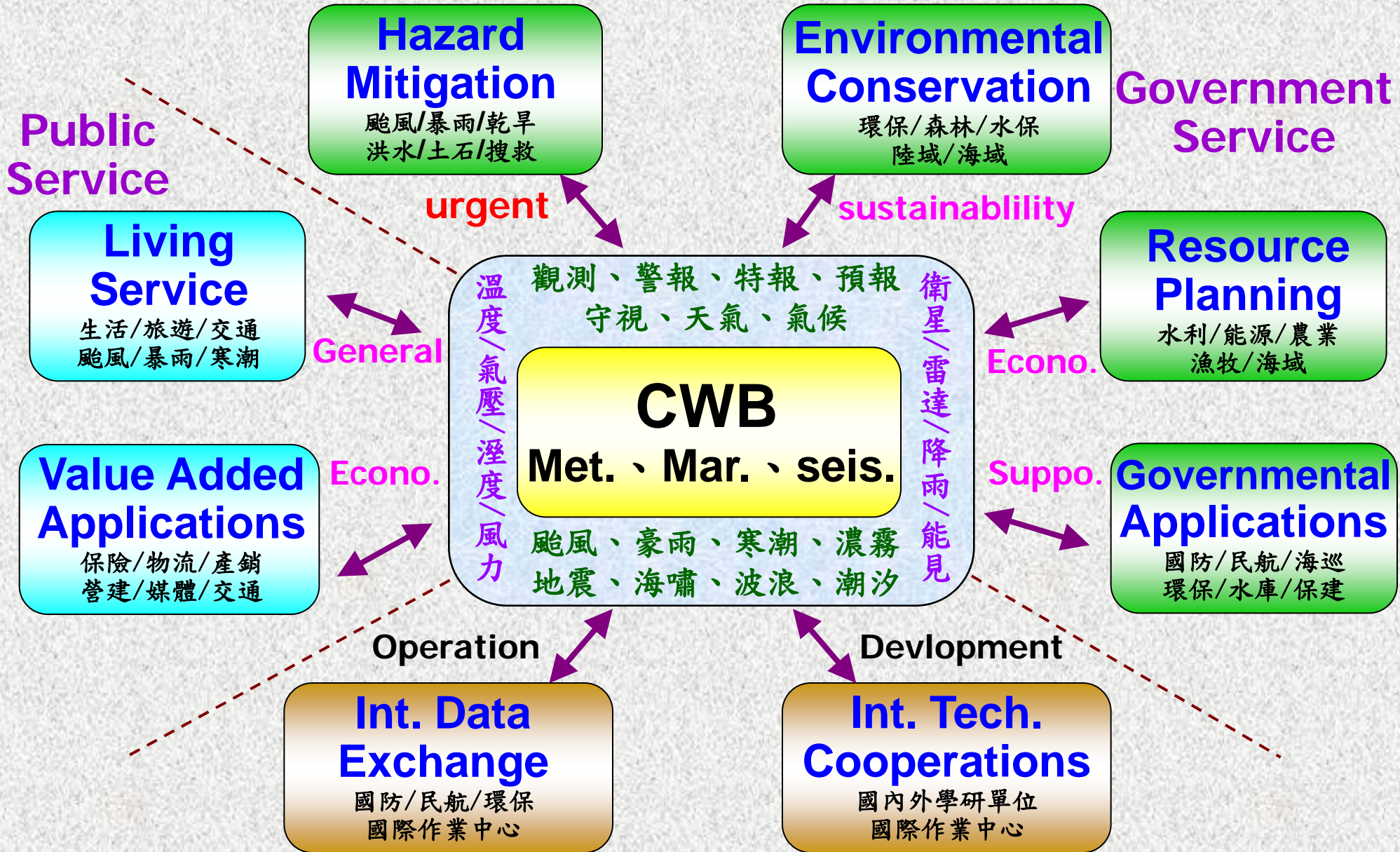
Complex terrain, intersection of continent Asia and Pacific ocean,  
intersection of tropical and sub-tropical monsoon area,  
prone to have typhoon, heavy rain fall, cold surge and drought



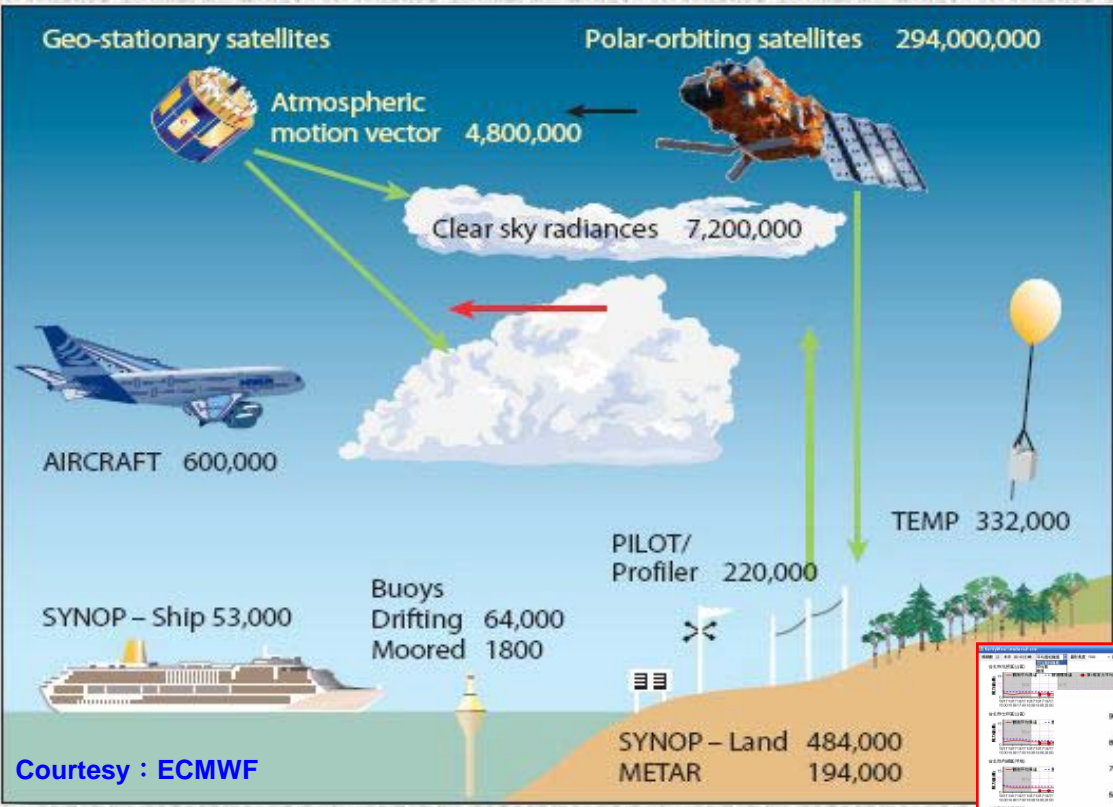
- **Location**  
land-sea boundary(121E,24N)
- **Size**  
400km × 150km
- **Topography**  
3/4 mountain area  
central mountain ridge : 2000m avg  
strong terrain forcing
- **Sever weather phenomena**  
spring : MeiYu  
summer : Typhoon, sounder storm  
winter : cold surge
- **Forecast Challenges**  
**Typhoon & Heavy rain fall**

MTSAT2 紅外線雲圖 10/21 20:00

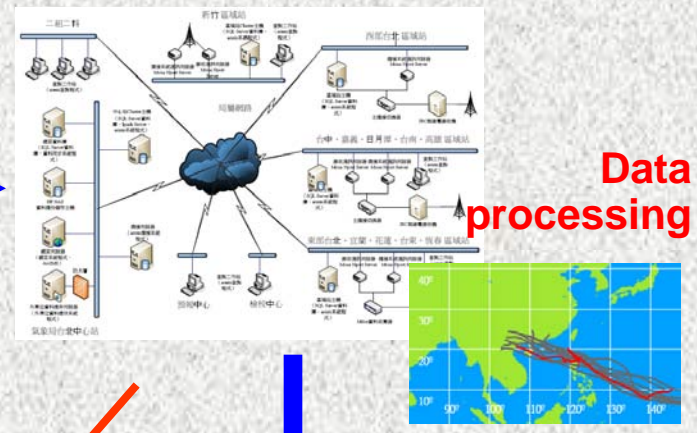
# Roles and Responsibilities of CWB



## International Collaborations

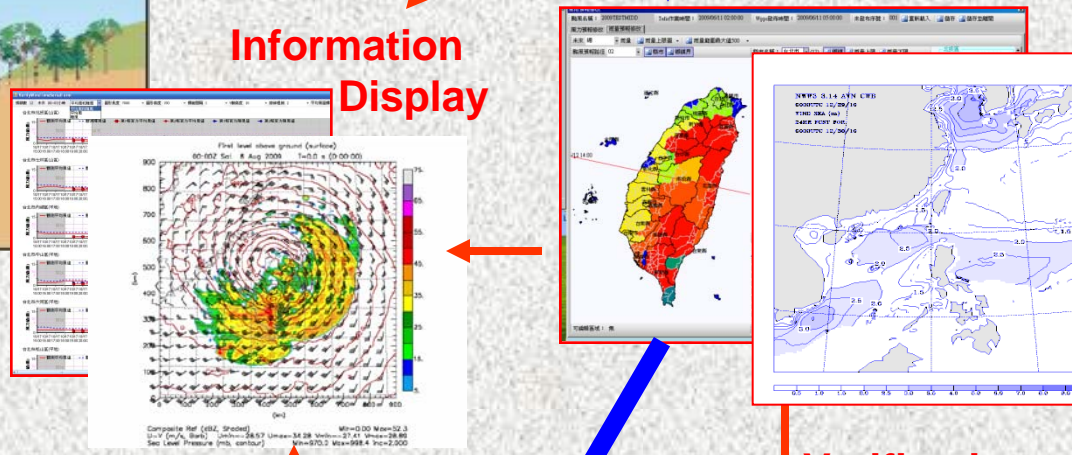


# Global Data Acquisition

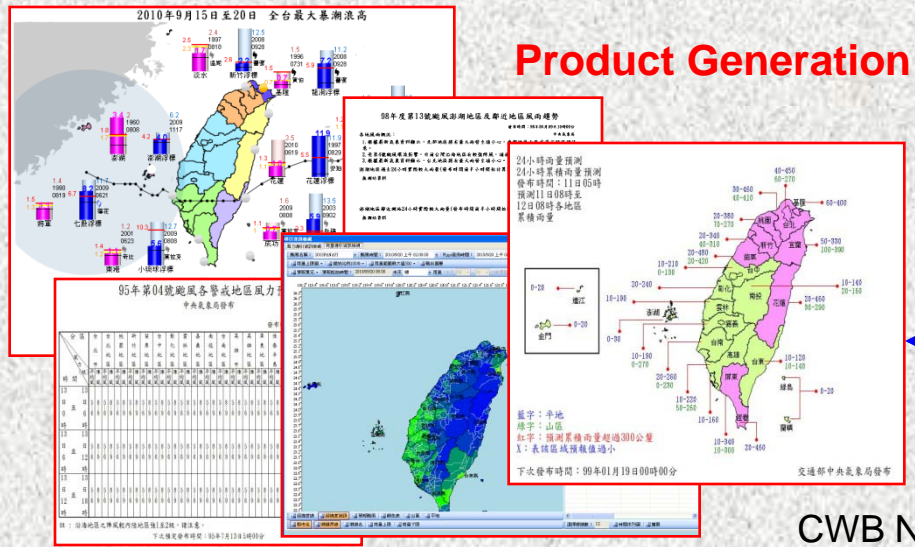


# Model Forecast

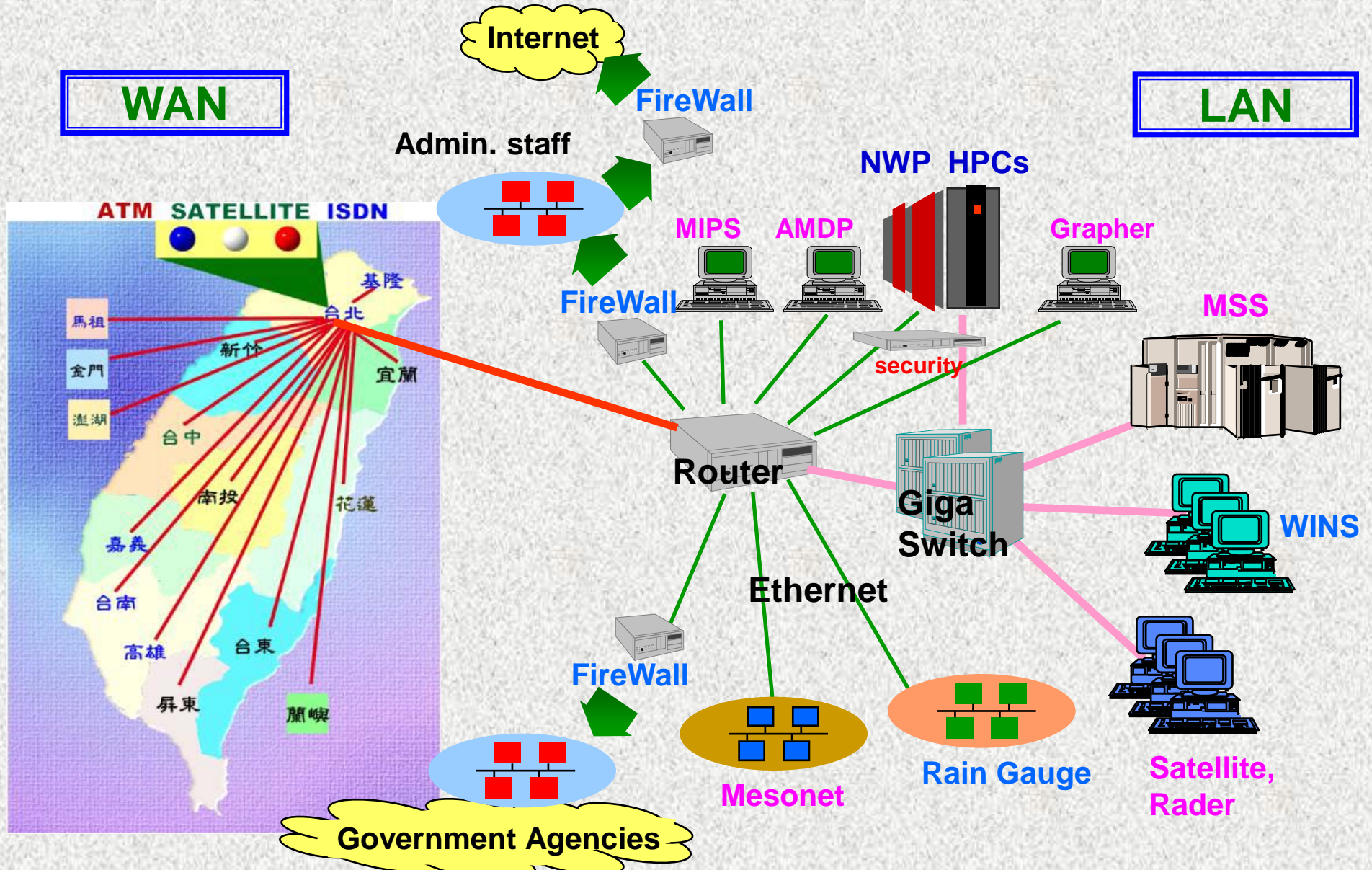
# Information Display



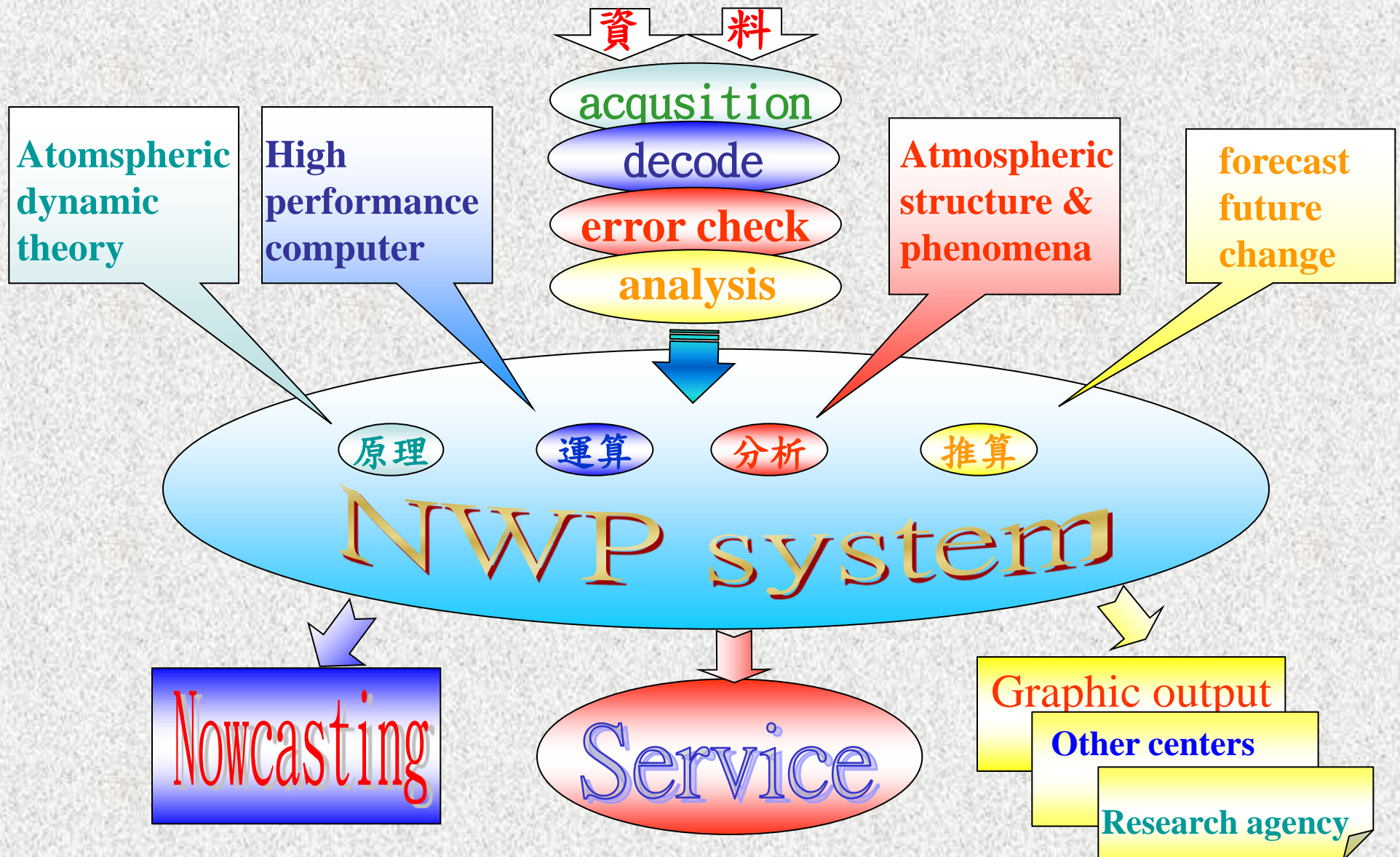
# Product Generation



# HW & Network for CWB Weather Information Processing

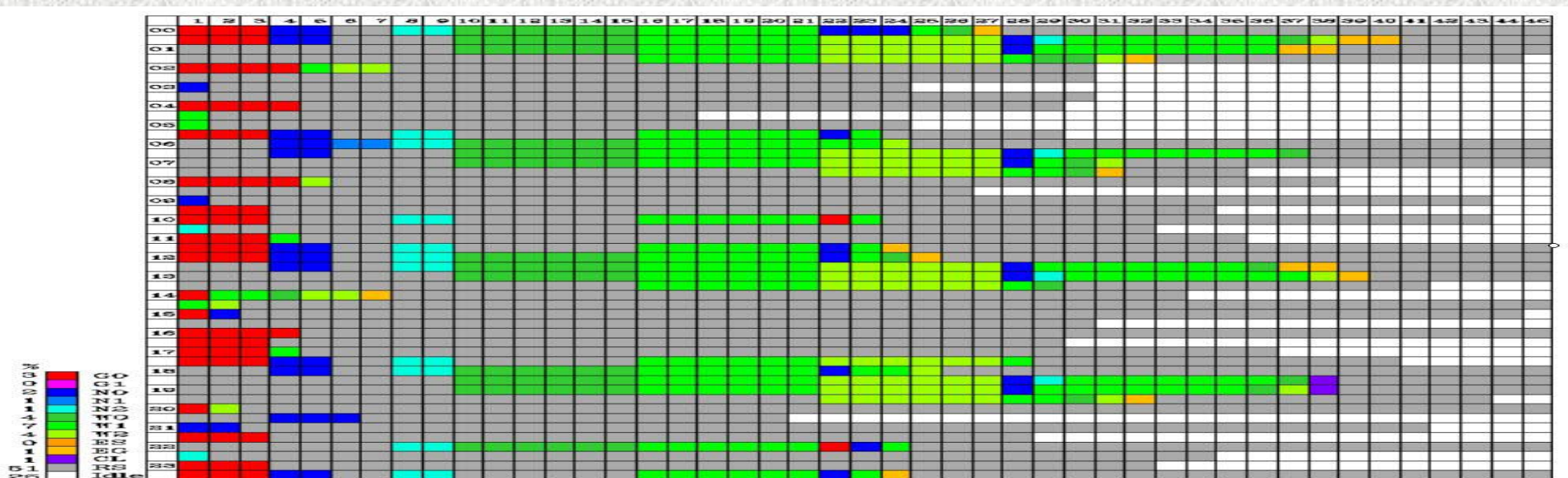


# Numerical Weather Prediction System Concepts



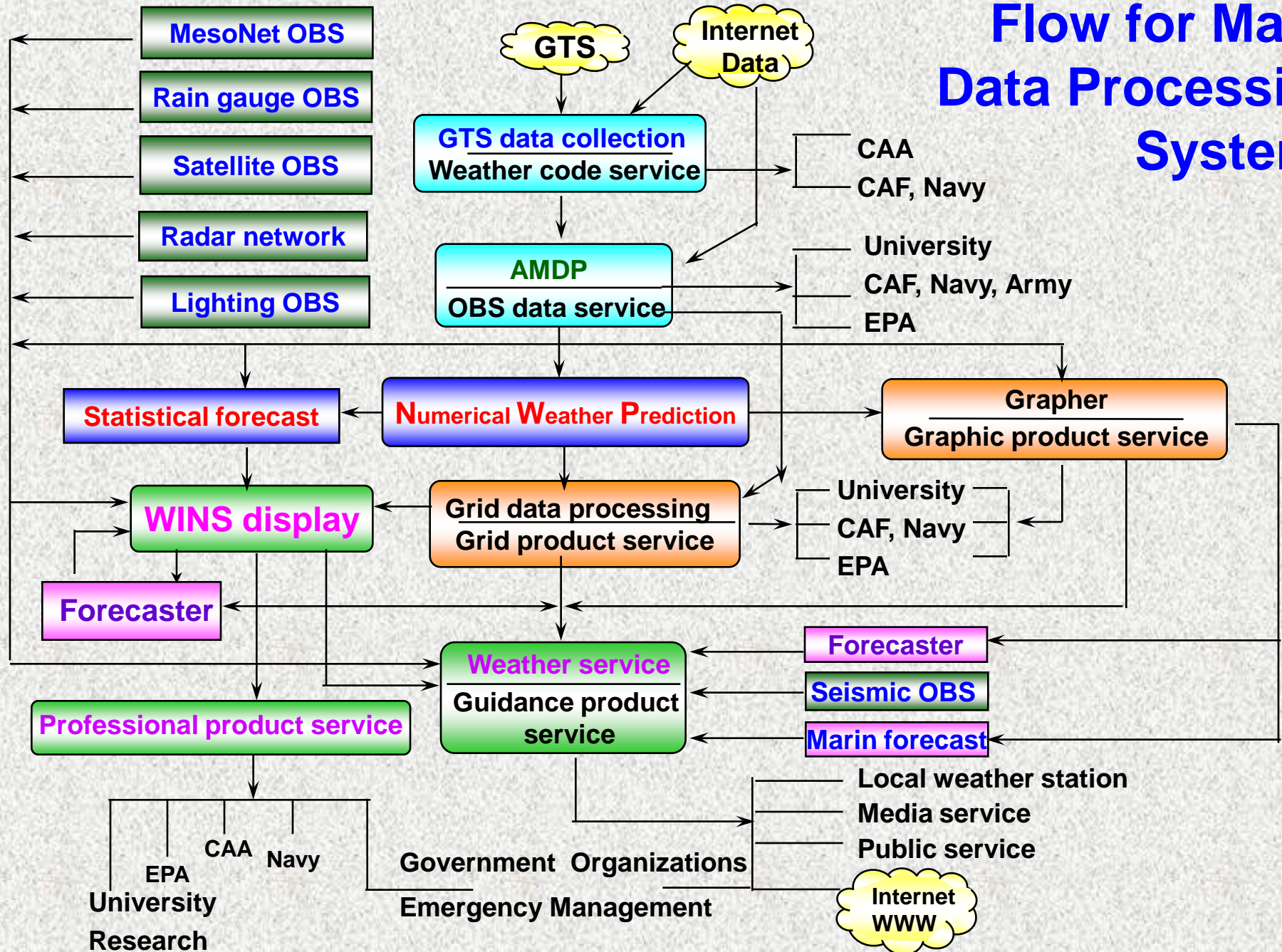
Model	Resolution	Run period( length)	# Mbr	Model days
GFS	T239-L30	00z(120h),12z(216h)	1	14
GFS	T319-L40	00z(120h),12z(216h)	1	14
NFS	45/15/5km-L30	00z/06z/12z/18z(84h)	2	28
WRF	45/15/5km-L45	00z/06z/12z/18z(84h)	2	28
TWRF	45/15/5km-L45	00z/06z/12z/18z(84h)	1	14
WRF	20/4km-L45	00z/06z/12z/18z(84h)	1	14
LAPS	9km-L31	every 3 hours(12h)	4	16
GCFS	T42-L18	1st(210d), 16th(210d)	40	560
RCFS	60km-L18	10th(150d)	30	150
total				838

**CWB  
NWP  
Models  
in  
operation**





# Flow for Major Data Processing Systems

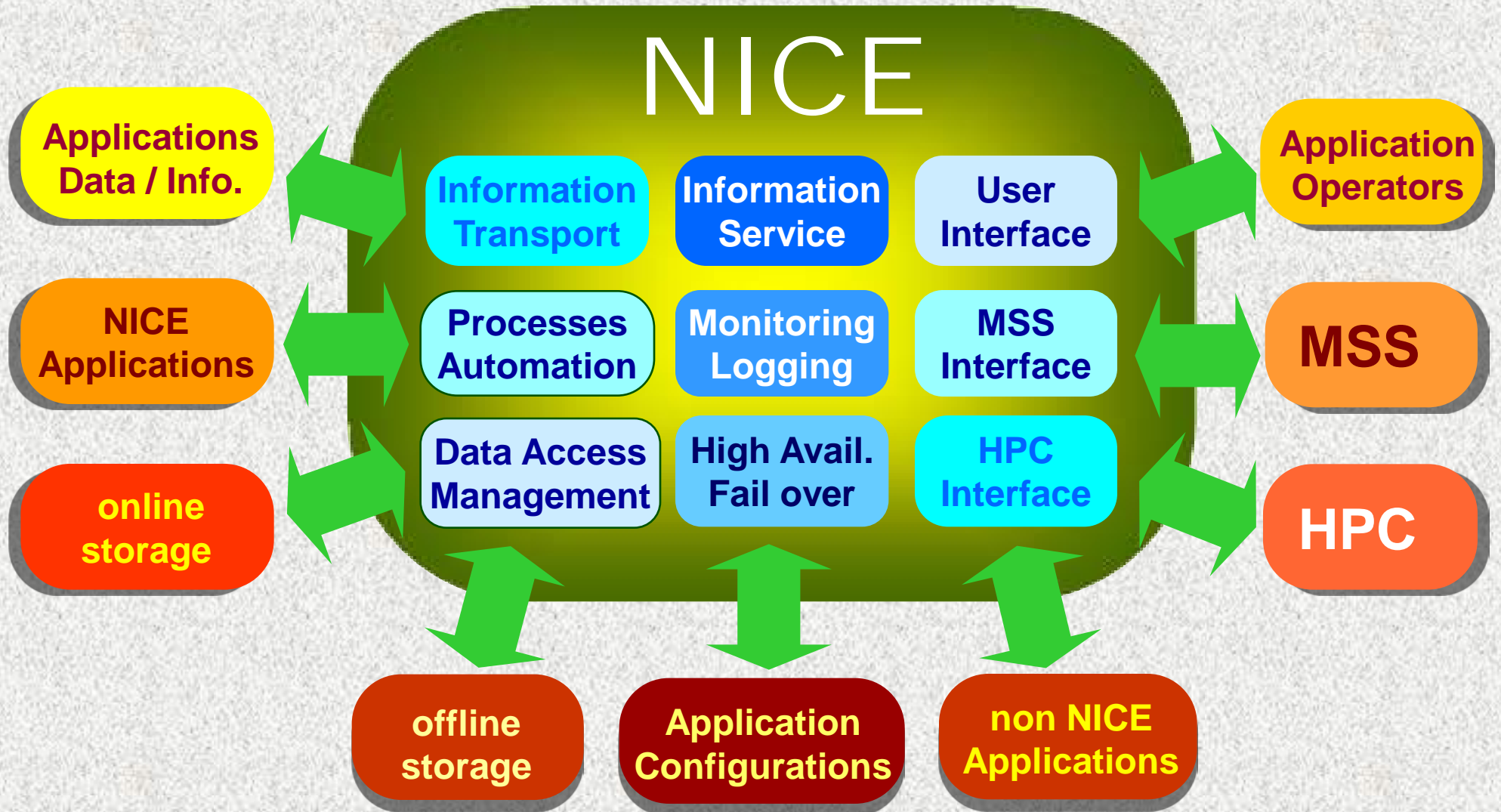


# The need for an integrated software development environment and application framework

to

- Support the development and operation of various real time distributed meteorological data processing systems.
- Reduce the efforts in developing and maintaining similar automation mechanism for different application systems. (maximize reusability)
- Integrate past experiences and best practices in system operation mechanism development become an unified architecture and tool kits for optimal system operations.
- Utilizing open system software technologies, components & standards to speed up AP development while maintaining the system's operability, flexibility, reliability and interoperability.

# Network Information exChange Environment



# NICE components (1/3)

## (1) Information Transport facility - IT

Provides the solutions for reliably exchange of data and/or messages in different hosts within or among systems across network. Access controls can be applied to information objects and hosts if so wished.

## (2) Process Automation facility - PA

Provides the solutions for automated processes management. The process activation mechanisms include : time driven (one time or periodical), event driven (single event or logical combination of multiple events). The management functions include : creation / deletion / rerun, process queueing, # of processes, execution elapse time, ...

## (3) Data Access and Management facility - DA/DM

Provides the solutions for on-line data records and files access in local or remote hosts across network. Files can be either plane or indexed. File management mechanism includes : creation, purging, archiving, backup, restore.

# NICE components (2/3)

## (4) Information Service facility - IS

Provides the solutions for reliably receiving and sending information objects with standard FTP, RCP & LDM protocols to interface the outside world. Status detection, Timeout, retry, multithreading and queueing mechanisms are provided for reliable transport management.

## (5) System MONitoring & LOGging facility – MON/LOG

Provides the solutions for detecting, monitoring, logging & reporting resource utilization and/or processes activities events of application systems. Events include : resource usage & utilization, data availability, network connectivity, process life cycle, activities timing. All events can be centralized managed and displayed in an operator UI.

## (6) System Fail Over facility - FO

Provides the solutions for maintaining high availability of system operation. Critical resources and services can be configured, monitored, managed and failovered by a decision making kernel with the support of activity monitoring, abnormal detection and fault isolation.

# NICE components (3/3)

## (7) User Interfacing facility - UI

Provides the solutions for users and operators to interface with the system. A set of X-window based widgets include : menu items, selection list, command button, file selection, text entry, dialog box & message window can be configured and composed via a scripting language for system's specific needs.

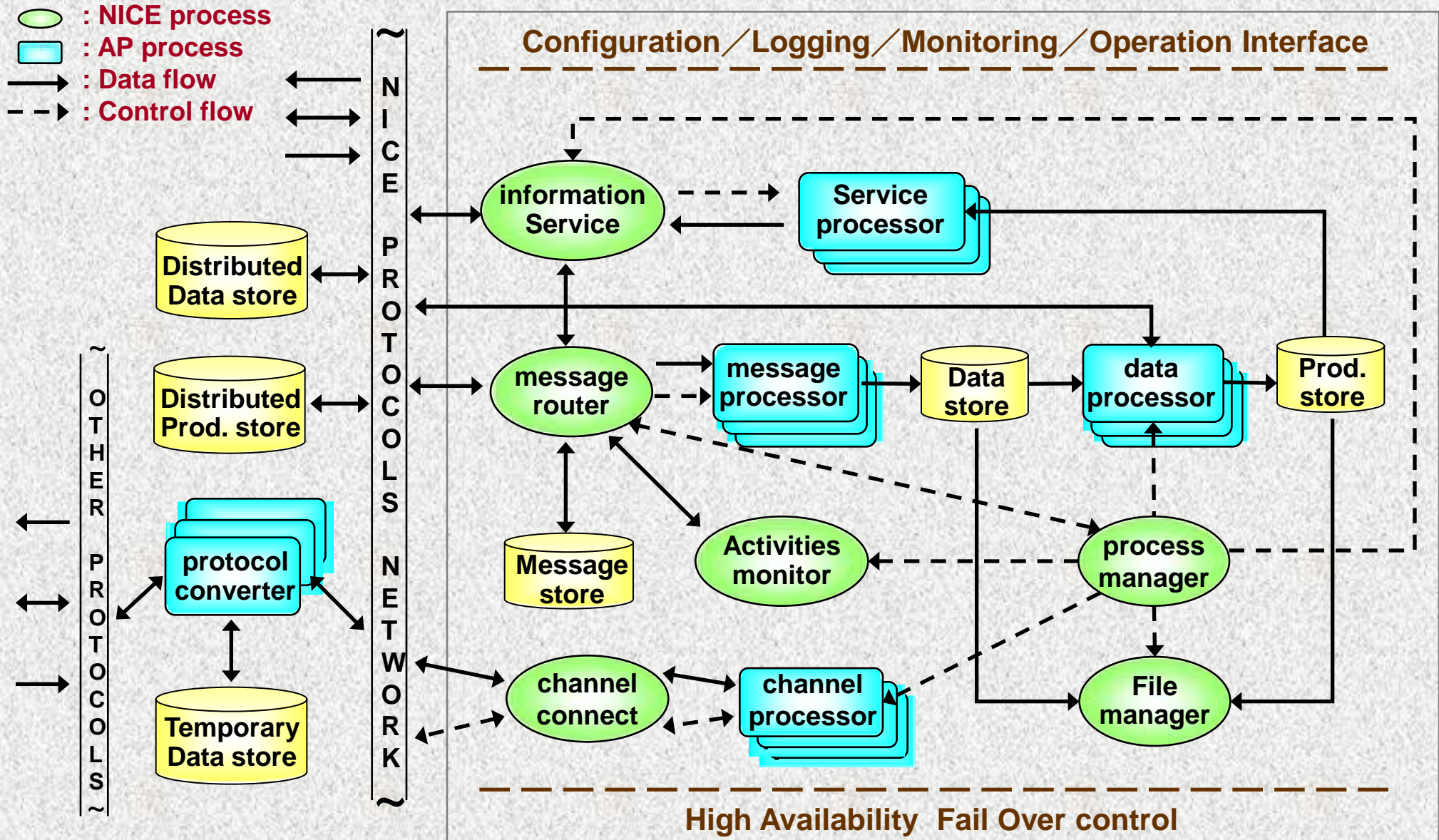
## (8) MSS interfacing facility - MSS

Provides the solutions for interfacing with the Hierarchical Storage Management system in CWB. Storage pool inventory query, migration/demigration control and basic file operations can be applied to file objects in local and/or remote storage devices and/or servers.

## (9) HPC interfacing facility - HPC

Provides the client side solution for interfacing with the High Performance Computer system in CWB. A Simplified commands set to encapsulate different batch systems commands for most commonly used commands for Job submission, execution control & status query.

# NICE Application Framework & Operation Concept



# Grid Architecture

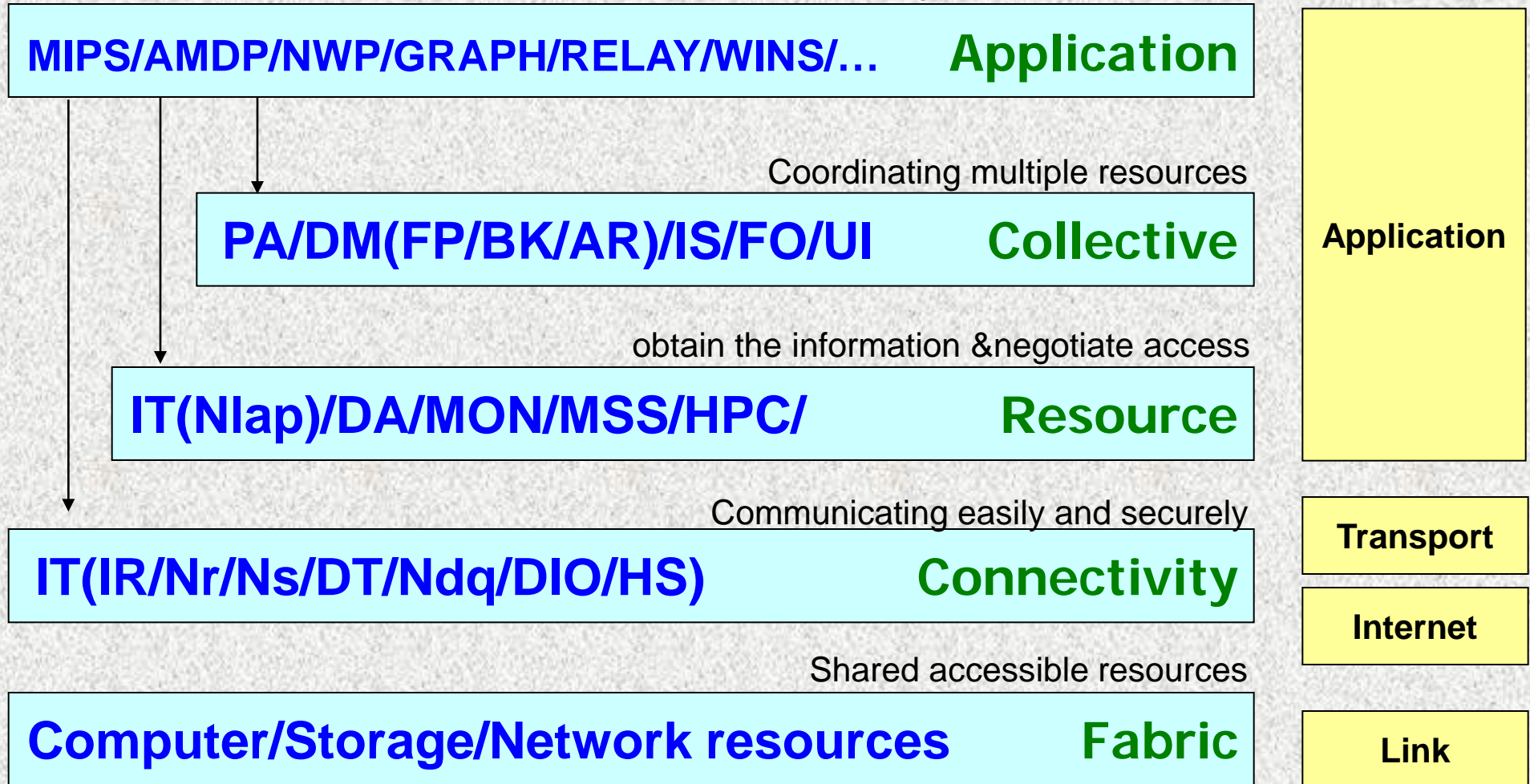
defined by Ian Foster etc.

## NICE

## GRID

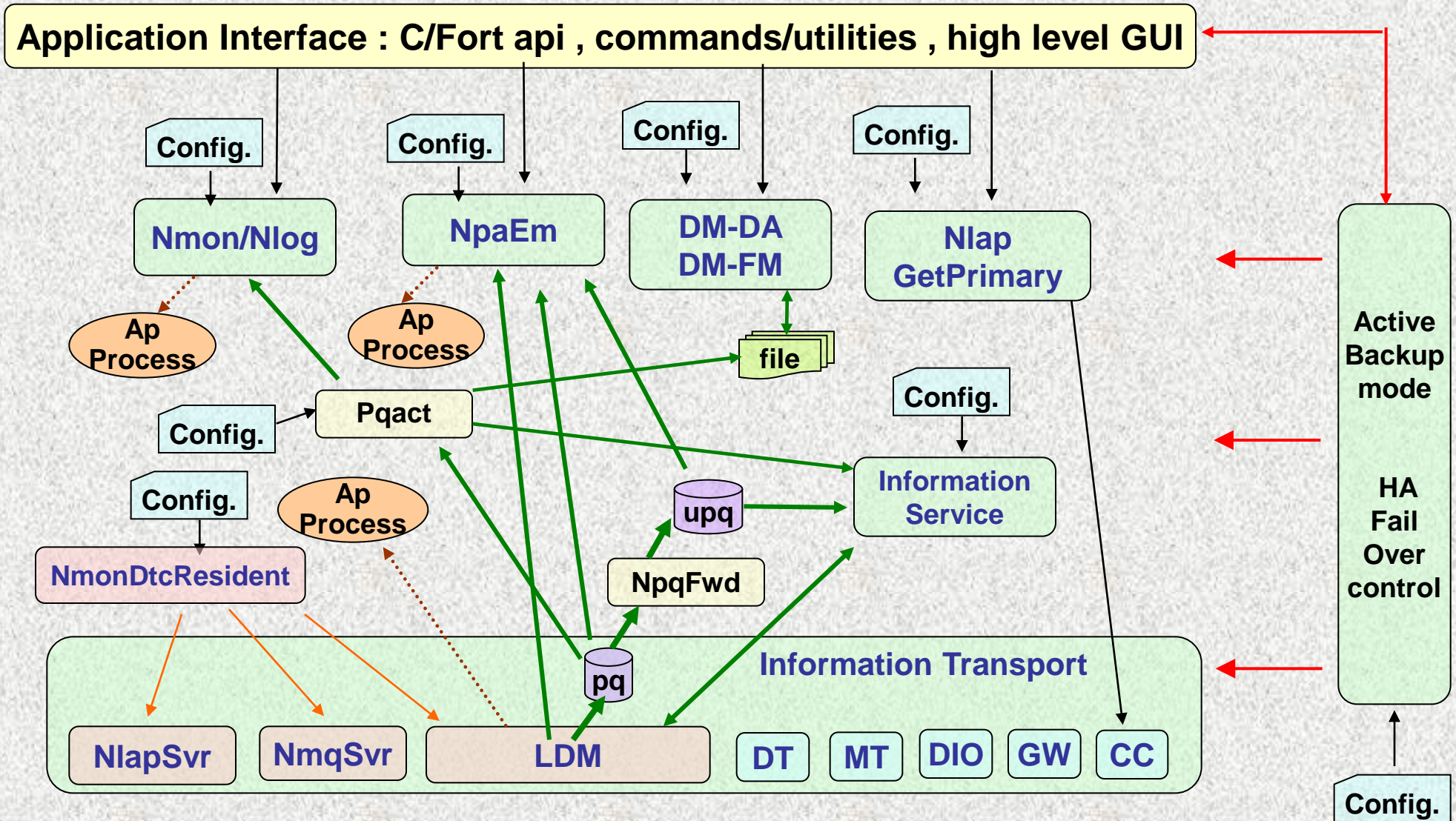
## Internet

user applications that utilizing under layer services

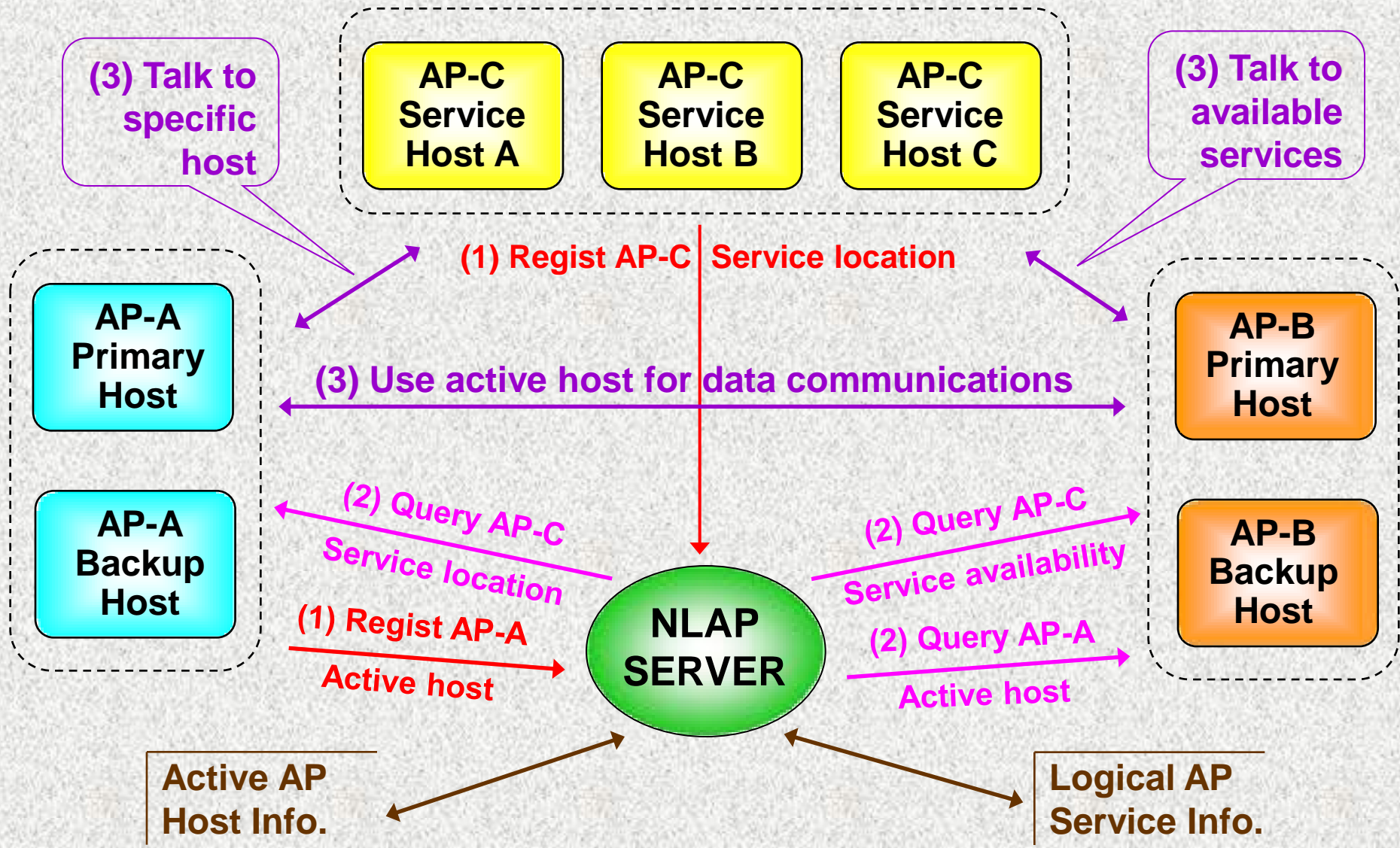




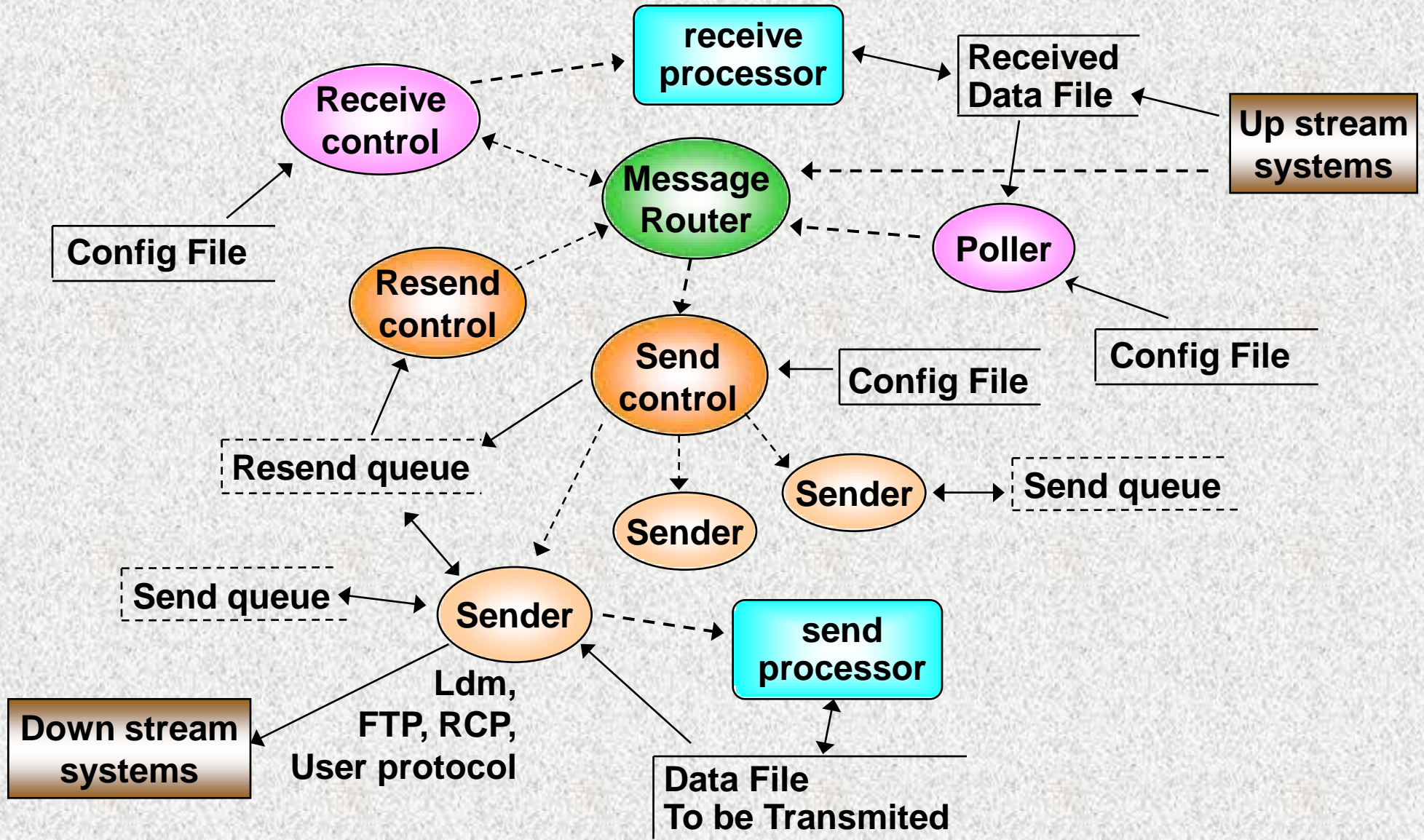
# NICE Application development concepts



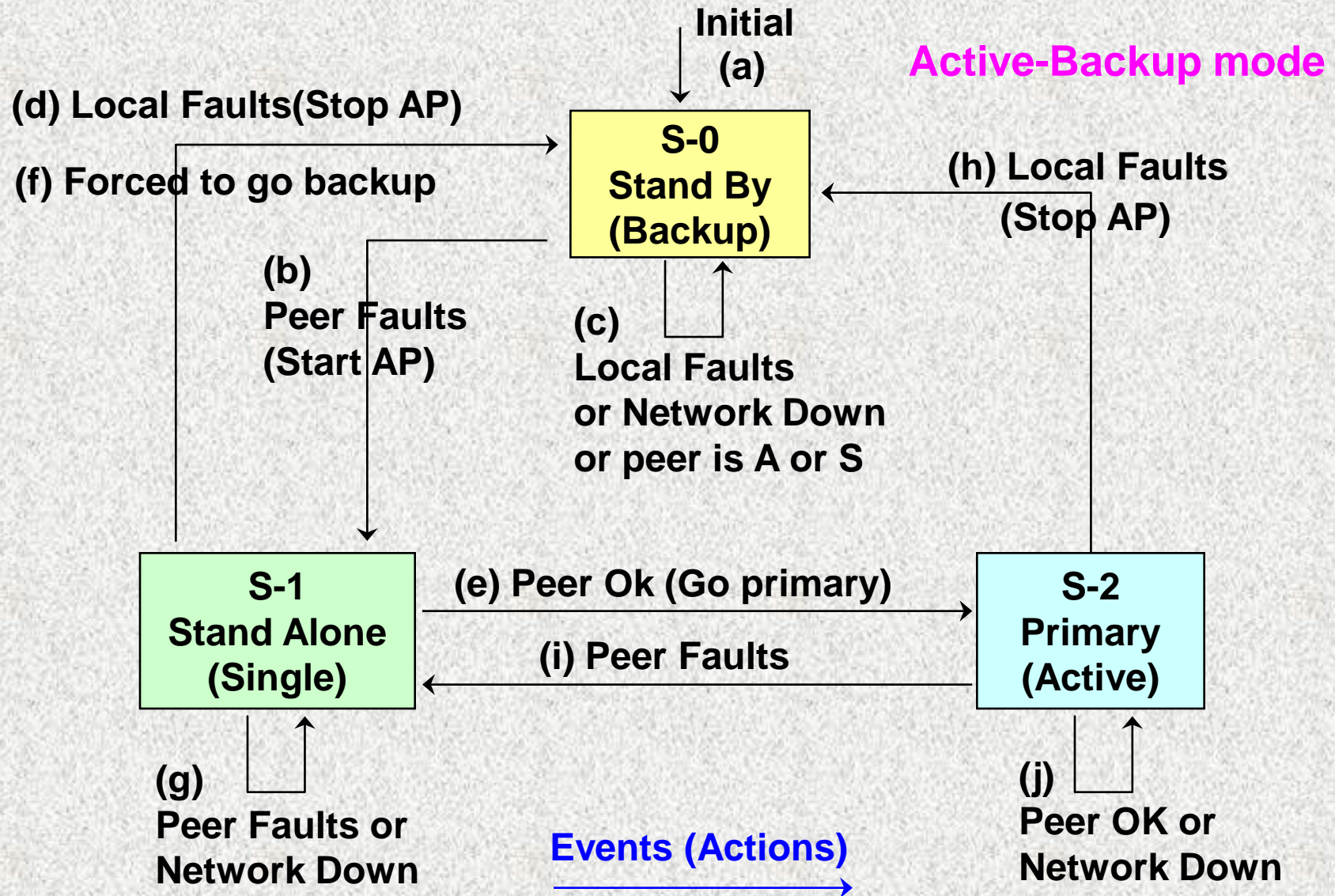
# NICE LAP operation concepts



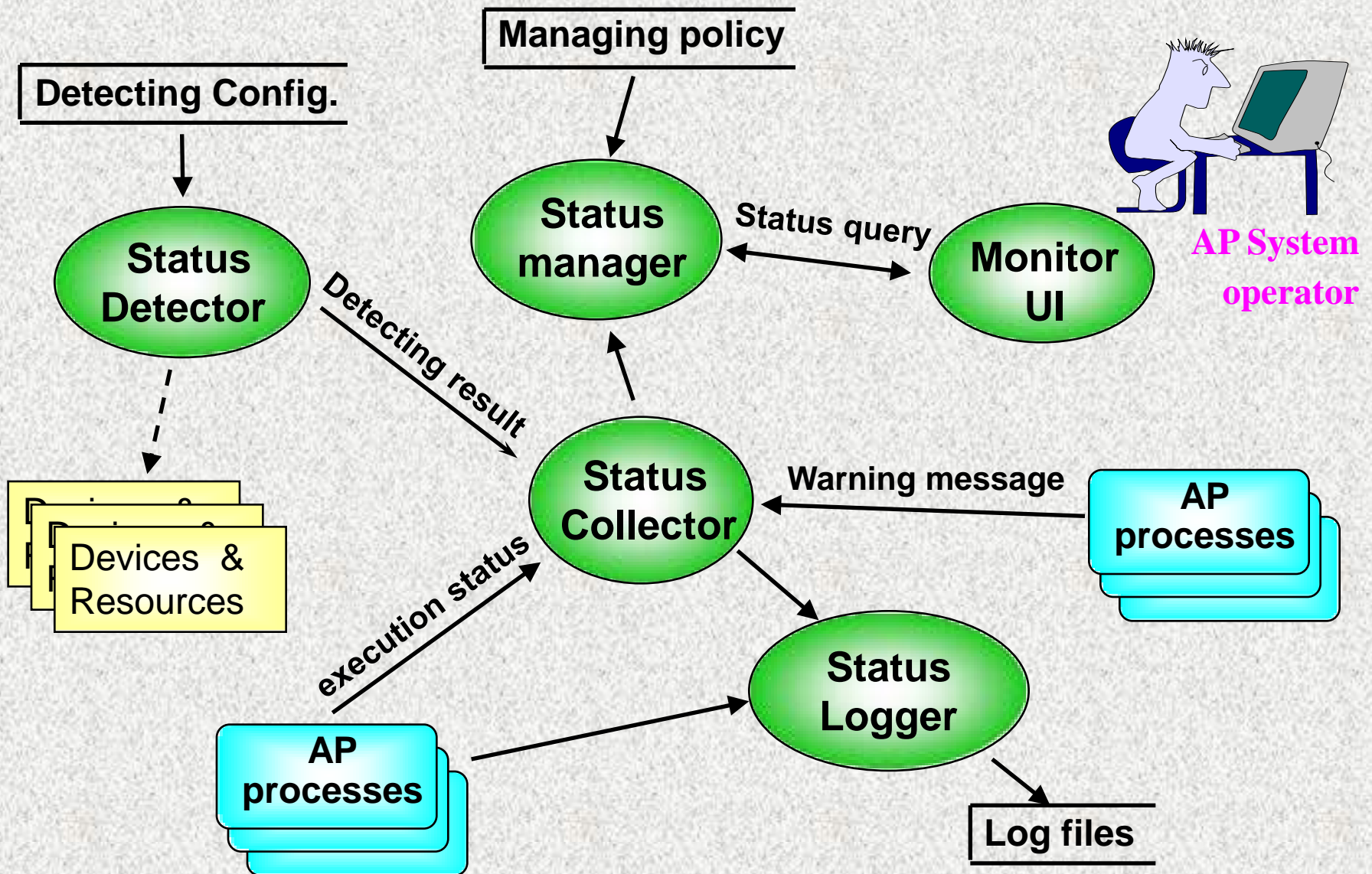
# NICE Information Service operation concepts



# NICE HA/FO operation concepts



# NICE Mon/Log operation concepts



# Real world applications and future

The NICE has been exist, utilized and continuously improved for about 10 years in CWB. Currently, 147 hosts of 39 systems were installed and running some components of NICE. Every day, over 1.2 million information objects are routed by NICE message routers and over 150 thousand processes are managed by NICE process managers. The storage volume managed by NICE file manager around 20TB and the data access transaction per day over 6 million records(files) while the transaction volume well exceed 10TB. The product files delivered by information service to end users and/or down stream systems outside CWB are over 35 thousand files and exceed 100GB.

Still, the NICE needs to be enhanced to increase it's support to web browser based UI and Linux HA based fail over control. The NICE also needs to implement the support for the new HPC to be procured in the next few years.

# Thanks for your attention



## Questions ?