

SCEAPI: A Unified Restful Web APIs for High-Performance Computing

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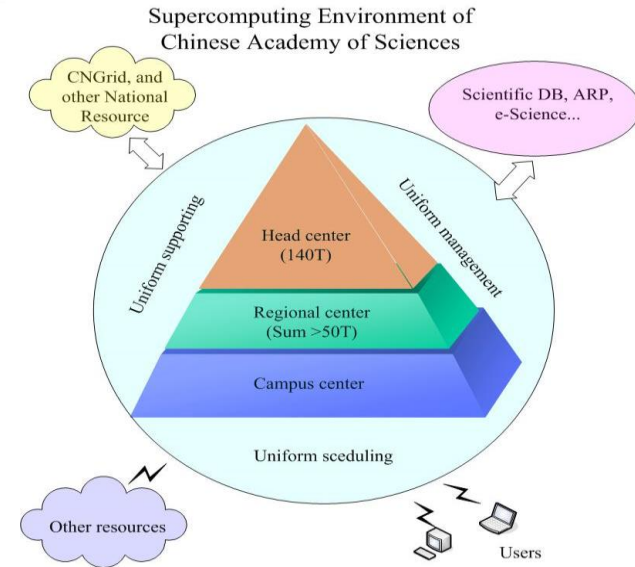
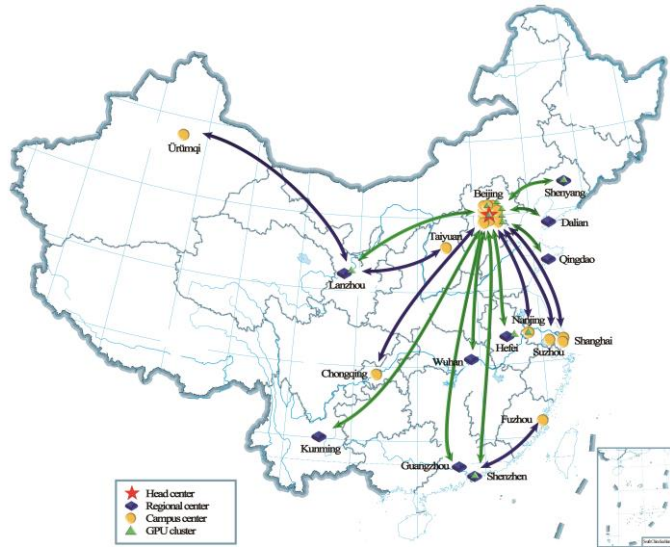
- Introduction to our team
- China Scientific Computing Environment
- SCEAPI
- Successful examples
- Future work

Introduction to our team

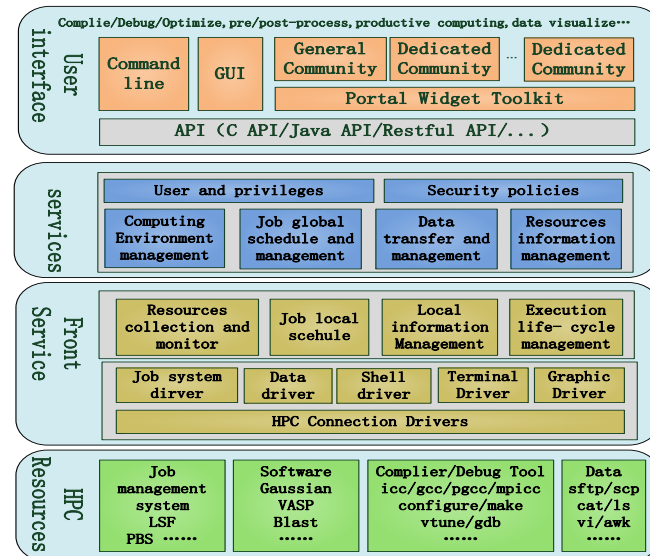
- Build and maintain China Scientific Computing Environment;
- Develop and optimize massively parallel computing applications in various subject areas;
- Provide technical support and consultation on HPC.



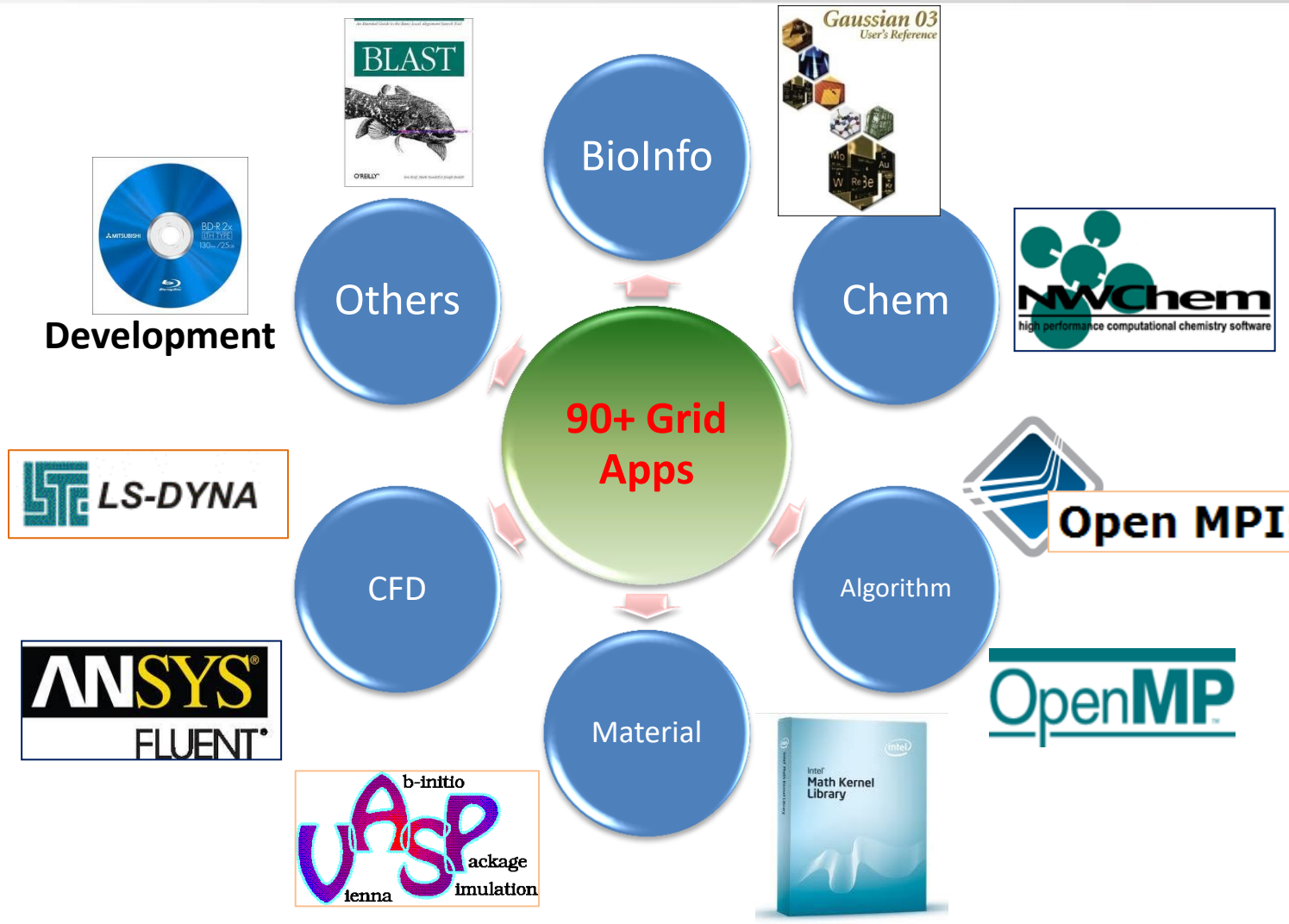
Scientific Computing Environment



- CPU: 1300Tflops
 - deepcomp7000; ERA
 - National Supercomputer Centers
- GPU: 3000 Tflops
 - 11 institutes from CAS

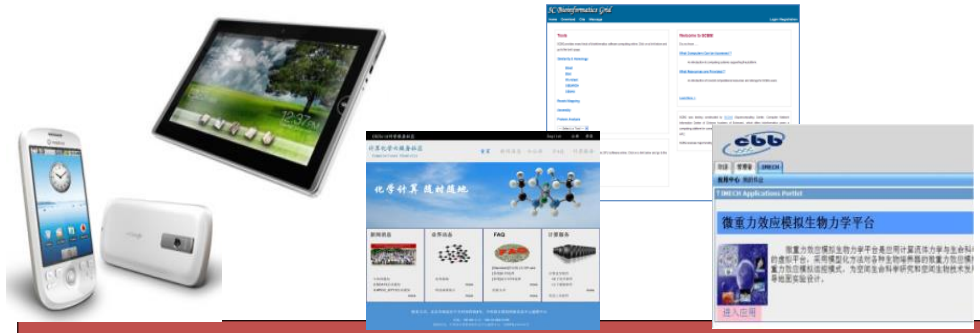
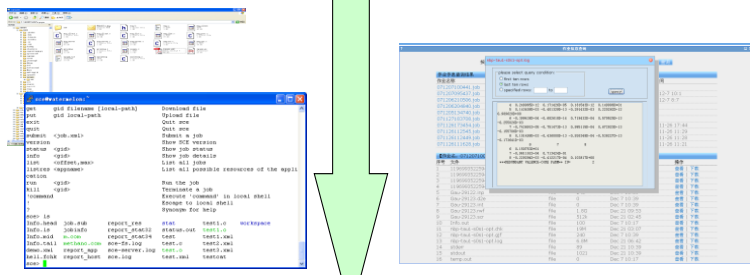


Scientific Computing Environment



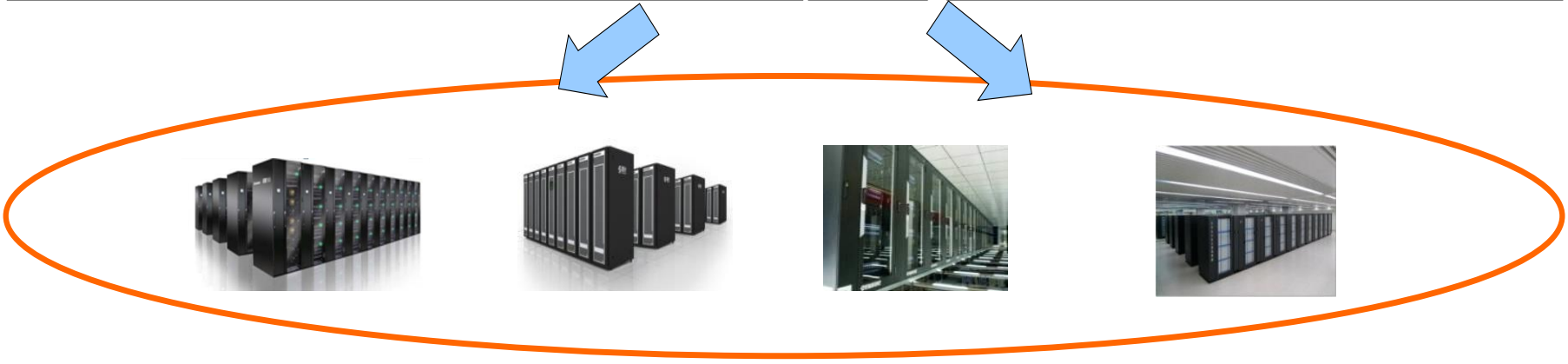
Scientific Computing Environment

Portal / Command Line



Programming Interface

Scientific Computing Cloud



Unified Service, Schedule and Management

- Introduction to our team
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Why we need RESTful API ?

Many disciplines:

- ✓ Chemistry, physics , biology, astronomy ...
- ✓ Engineering, economy, environment ...

Various requirements :

- ✓ Users
- ✓ Applications
- ✓ Data

Massive resources:

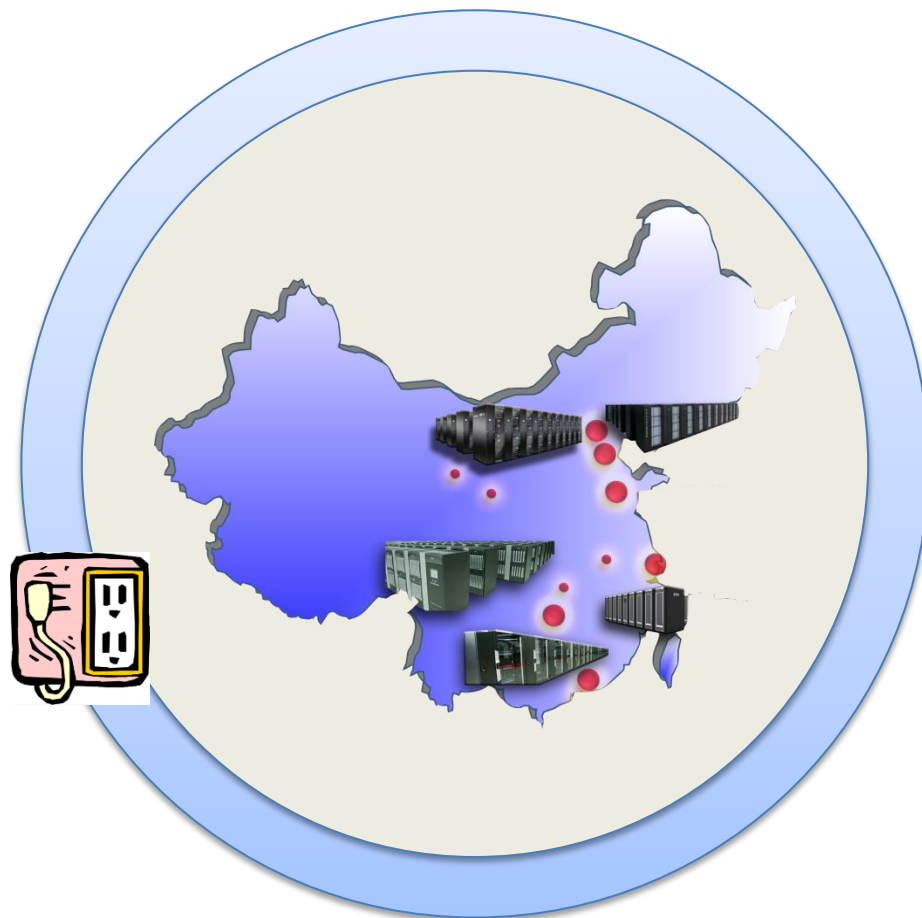
- ✓ SCE
- ✓ More supercomputer ..

Feature-rich client :

- ✓ Scripts
- ✓ Command line
- ✓ Web portal
- ✓ Mobile app.

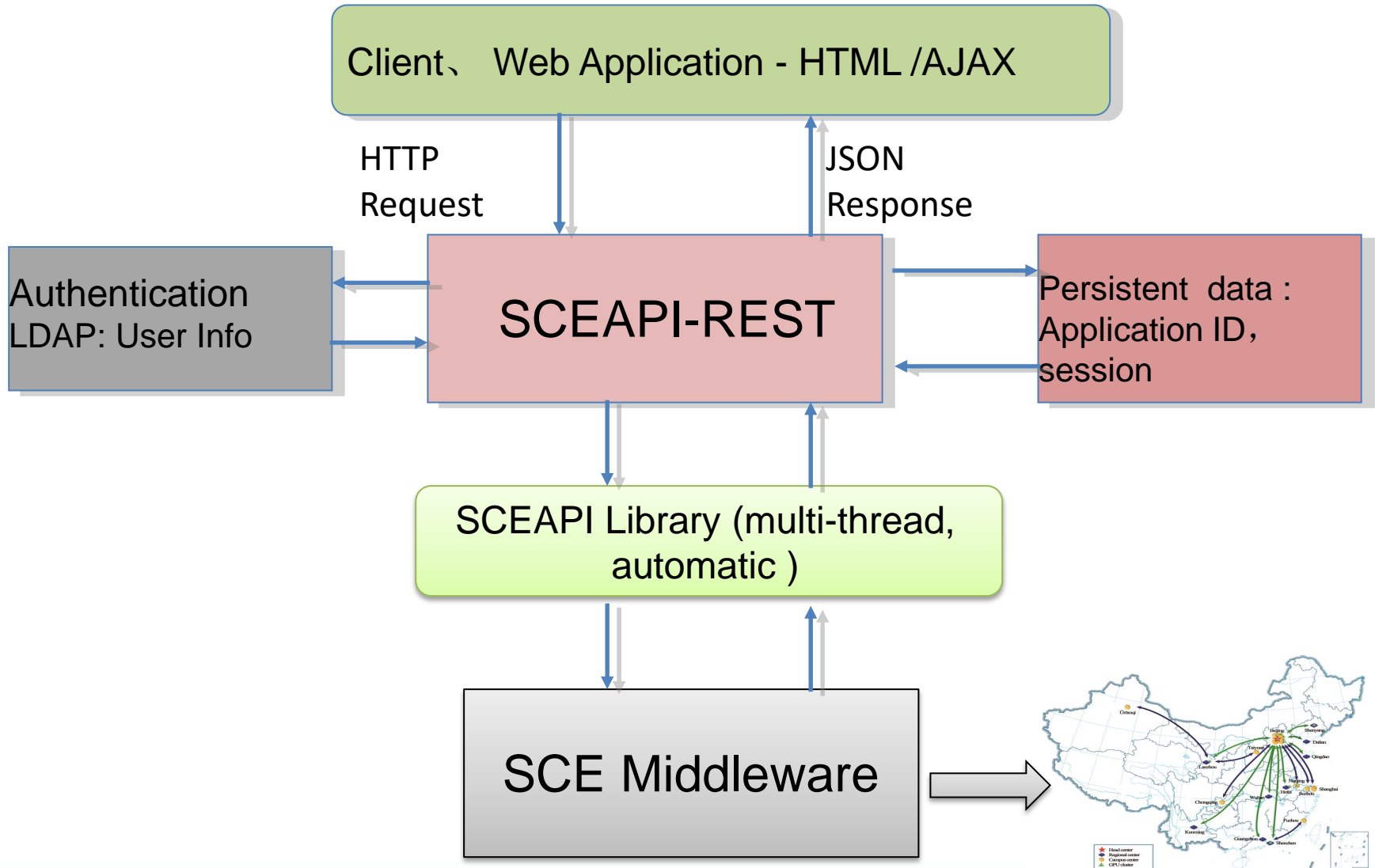
RESTful
API

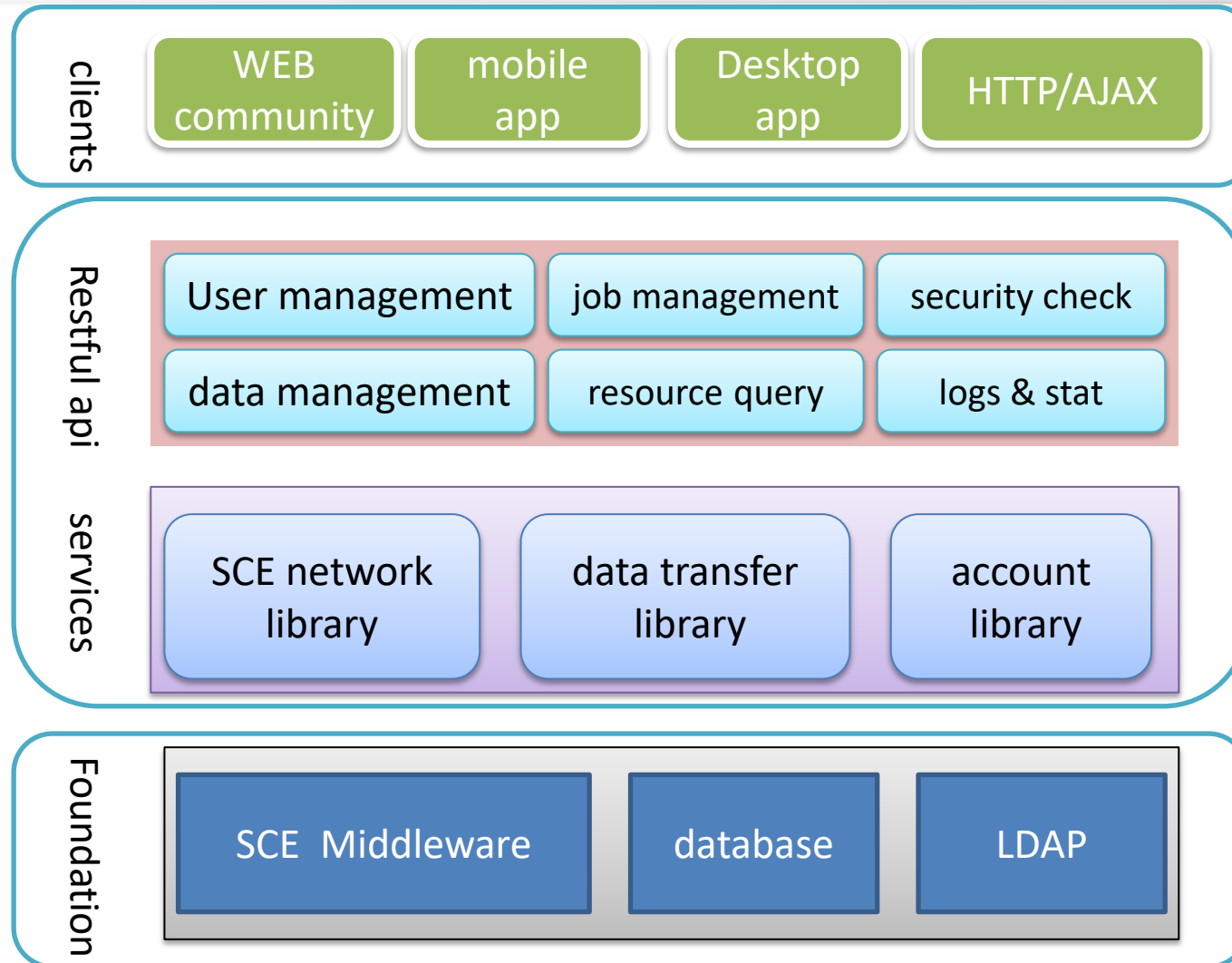
Cross platform and languages



Our vision: computing as infrastructure

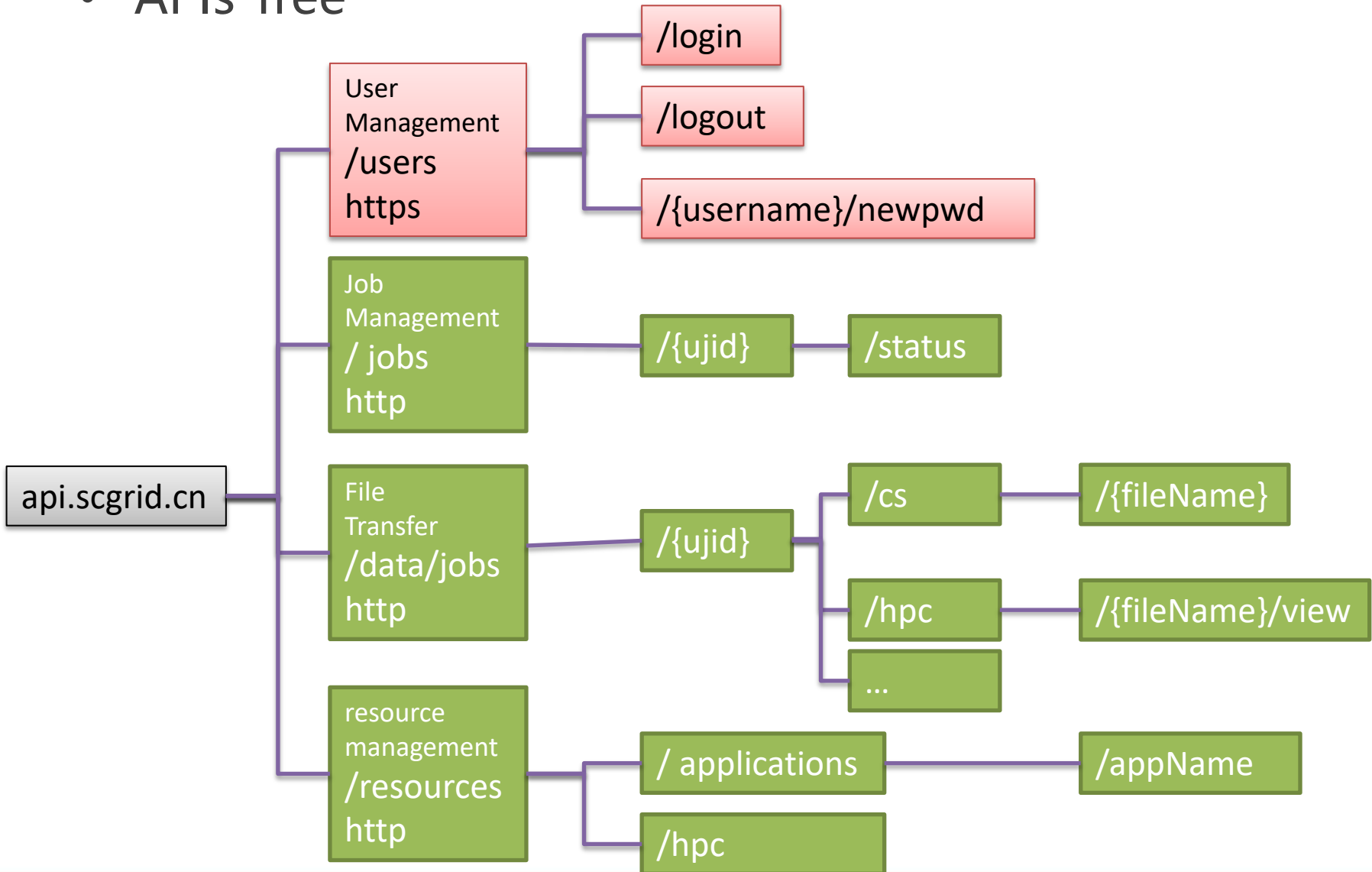
• Architecture





the modular and layered architecture

- APIs Tree



□ User Management

No.	method	path	remark
1	GET POST	/users/login	Login to the SCE environment
2	GET	/user/logout	Exit from the SCE environment
3	POST	/users/{user}/newpwd	Change password, or reset password if you are an administrator.

Forget your own password?

Redirect url: <http://user.scgrid.cn/scgriduser/password/forget>

- Job management

No.	method	path	remark
1	GET	/jobs	Return a list of qualifying jobs.
2	GET	/jobs/update	Updated jobs for some time.
3	POST	/jobs	Submit a job depict by JSDL
4	GET	/jobs/{jobid}	Return information of the specific job
5	DELETE	/jobs/{jobid}	Kill the specific job.
6	GET	/jobs/{jobid}/status	Query status of the specific job
7	PUT	/jobs/{jobid}/status	Set status of the specific job

- File Transfer

No.	method	path	remark
1	GET	/data/jobs/{jobid}/cs	List job directory in SCE.
2	GET	/data/jobs/{jobid}/hpc	List job directory in HPC.
3	GET	/data/jobs/{jobid}/hpc /{fileName}/view	View some lines in the text file.
4	POST	/jobs/{jobid}	Upload files.
5	POST	/data/jobs/{jobid}/cs/ {fileName}	Upload a file to the specific directory.
6	GET	/data/jobs/{jobid}/cs/ {fileName}	Down the specific file from SCE.

- Advanced feature: data transfer
 - Big data? many small files?

No.	method	path	remark
1	GET	/data/jobs/{ujid} /fileUpload	Get a url for uploading a file, and upload the file with an independent service.
2	GET	/data/jobs/{ujid}/files Upload	Get a url for uploading several files, and upload the files with an independent service.
3	GET	/data/jobs/{ujid}/file Download	Get a url for downloading a file, and upload the file with an independent service.

- Advanced feature: Job Recycle Bin

No.	method	path	remark
1	DELETE	/jobs/recycleBin/delete	Delete specified jobs or files immediately or to the recycle bin.
2	DELETE	/jobs/recycleBin/empty	Empty all things in the recycle bin.
3	POST	/jobs/recycleBin/restore	Restore specified jobs or files from the recycle bin.

- Typical scenarios
 - Submit a job
 1. Collect parameters and generate the JSDL file
 2. Submit the JSDL file [POST /jobs]
 3. Upload the input file/files [POST /jobs/{jobid}]
 4. Start the job [PUT /jobs/{jobid}/status]
 - Submit a batch of jobs
 - Write some scripts
 - Develop web communities

- Typical scenarios
 - Manage jobs
 - Query job information about jobs
 - View some lines in text files when the job is running
 - Kill some jobs
 - List workspace for a job
 - Download output files
 - Advanced
 - Delete jobs
 - Delete workspace for jobs

- How to use?

Java library & demo

Python library & demo

JavaScript library

Apply

- Id and Key
- Targets
- Accounts for test

Develop & test

- Dedicated test bed
 - SSO & OAuth2
 - programming
 - testing

Deploy

- Application audit
- Deploy to SCE:
 - Replace root urls for API, SSO and OAuth2

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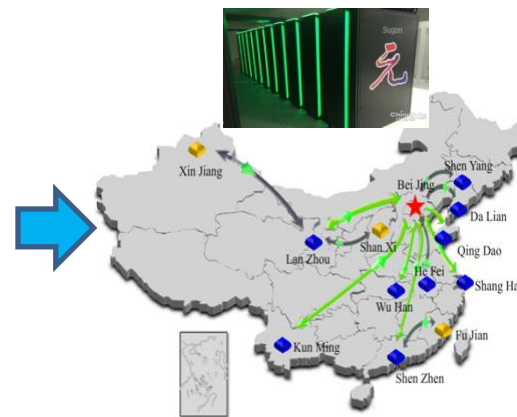
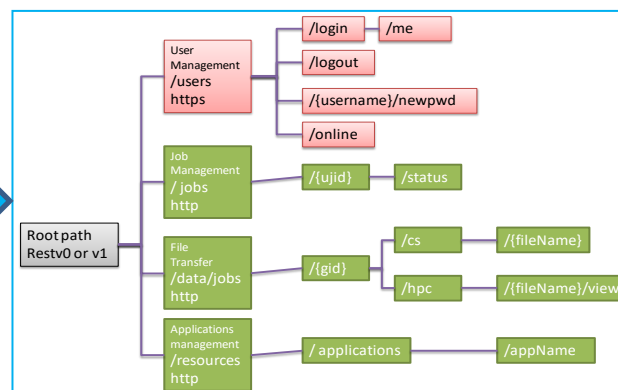
CNIC-ATLAS Cooperation

- ATLAS

- ATLAS is a particle physics experiment in the Large Hadron Collider at the CERN laboratory
- Need more computing resources

- SCE

- provide computing resources quickly
- > 400+ users from CAS & universities;
- > 100,000,000+ CPU hours



CNIC-ATLAS Cooperation

- Quick steps:
 - 1, confirmed interfaces, PBS-like Commands by Python
 - 2, design and implemented Python library and PBS commands based on SCEAPI;
 - 3, ARC-CE integrated SCE based on python examples and library;
 - 4, submitted jobs to SCE.

examples

job mamangement:
sqsub, qstatus, qkill

data transfer:
put, get

authorization:
login

python library

login/logout

resource query

md5
generation

data transfer

job management

encode
/decode json

SCEAPI

dependent libraries

requests
& toolbelt

md5

json

ATLAS PanDA jobs

bigpanda.cern.ch/jobs/?computingsite=BEIJING-ERA_MCORE

ATLAS PanDA Dash Tasks Jobs Errors Users Sites Incidents Search Admin Prodsys Services VO Help

PanDA jobs, last 12 hours. Params: limit=6000 computingsite=BEIJING-ERA_MCORE apanda058 Built 01:51, cache 3

138 jobs in this selection
Site: BEIJING-ERA_MCORE Show site information page

Job modification times in this listing range from 2015-07-07 13:51 to 2015-07-08 01:51.
Job current priorities in this listing range from 1000000 to -1000000. See priorityrange in the job attribute summary to see how priorities are distributed.

Job attribute summary Sort by count, alpha	
atlasrelease (1)	Atlas-19.2.3 (121)
attemptnr (10)	1 (58) 2 (28) 3 (16) 4 (5) 5 (1) 6 (1) 7 (2) 8 (4) 9 (2) 10 (2)
cloud (1)	FR (138)
computingsite (1)	BEIJING-ERA_MCORE (138)
destinationse (2)	BEIJING-ERA_MCORE (17) IN2P3-CC (121)
homepackage (1)	AtlasProduction/19.2.3.7 (121)
inputfileproject (2)	mc15_13TeV (60) mc15_13TeV/mc15_13TeV (61)
inputfiletype (1)	EWT (121)
jobidtaskid (8)	5540187 (1) 5555960 (60) 5556052 (1) 5570250 (1) 5613931 (1) 5614110 (30) 5709593 (3) 5746584 (24)
jobstatus (7)	assigned (5) failed (7) finished (58) holding (1) running (5) starting (18) transferring (44)
minramcount (1)	2-3GB (121)
outputfiletype (12)	0-BEIJING-ERA_MCORE (2) 0-x86_64-BEIJING-ERA_MCORE (2) 1-BEIJING-ERA_MCORE (3) 1-x86_64-BEIJING-ERA_MCORE (1) 3-BEIJING-ERA_MCORE (1) 35-BEIJING-ERA_MCORE (1) 4-BEIJING-ERA_MCORE (1) 5-BEIJING-ERA_MCORE (2) 5-x86_64-BEIJING-ERA_MCORE (1) 6-BEIJING-ERA_MCORE (2) 6-x86_64-BEIJING-ERA_MCORE (1) HITS (121)

- Add more services, e.g. resource reservation
- Improve performance, e.g. data transfer, log



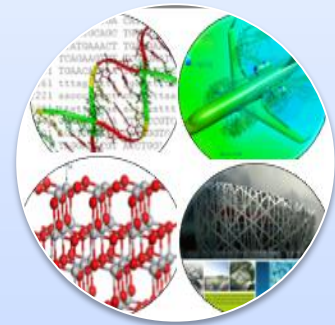
More resources

- Job schedule
- Security



More users

- Easy-to-use
- Stability



More areas

- Simple & flexible
- Feature-rich

Stable

Easy-to-use

Professional

Thank you!