

## Grid Accounting Concept Based on the Model of Public Utility Pricing



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## Concept

The concept is developed originally for the Internet (CATI project) and is later applied for the Grid in GACS
The accounting/charging process is decomposed into its subprocesses: metering/mediation, accounting, pricing, charging and billing



- Pricing Scheme
- Pricing scheme follows the tariffing model of **public utilities**Rates can be applied for each resource and for each metered parameter in a given time interval

$$TC_{j}(t) = \left(\overline{I}^{\pi}\right)^{T} \cdot \sum_{i=1}^{M} \left( \left( \left(\overline{\overline{C}}\left(\overline{t}_{j,e,i}\right) - \overline{\overline{C}}\left(\overline{t}_{j,b,i}\right)\right) \vee \overline{\overline{0}} \right) \bullet \overline{\overline{q}}_{i} \right) \cdot \overline{I}^{\rho}$$

# Data Partitioning

- Accounting/charging data should be partitioned because the amount of data collected can grow rapidly
- Vertical partitioning along the modules
- Horizontal partitioning by grouping the data per resource and per metered parameter



# Deployment

• After deciding how the accounting/charging data will be partitioned, a multisite configuration can be established



## User Interface

### Architecture

- Multilayered and multisite
- XSD schema based protocol description
- Secured communication using GSI and PDoH
- Unified data structures allow to integrate GACS with various Grid solutions (e.g. with gLite/APEL)

#### • GridSphere portlets

 Job and time interval (per month or per week) based billing



	mit	GridSp	here	Port	al							Csongc
Informatikai Központ Welcome Adm	ninistration Accounting	Accounting Administration	on									
Charging and Inv	voicing Charges Invoice	55			In	voice						
Query Begin time End time (y <sub>Query</sub>	(yyyy-MM-dd) yyyy-MM-dd)									=		
Consumer Begin time End time (y	(yyyy-MM-dd HH: yyyy-MM-dd HH:m	:mm:ss) 1m:ss)										
Resource Invoice												
Invoice Invoice no.	: 41618d321514d	i7b201153d099097(	00f4									
Provider: B	MEGrid Resource	Job	Begin	End time	Consumer: 🎮 Parameter	Param.	Price per	Usage	Currency	Net price	9/25/07 2:: VAT	19:37 PM UTC Price
BME IK	co boc iit boo bi	44284	time 9/9/07	9/16/07	name	unit	unit	4.0	ние	0.4	0.08	0.48
site usage BME IK	ce hnc iit hme hi	ce.hpc.iit.bme.hu	AM UTC 9/9/07	AM UTC 9/16/07	BaseCPUTime	second	0.1	3.0	HUE	0.3	0.06	0.36
site usage BME IK	ce.hpc.iit.bme.hc	.ce.hpc.iit.bme.hu	AM UTC 9/9/07	AM UTC 9/16/07	BaseCPUTime	second	0.1	3.0		0.4	0.00	0.30
site usage BME IK	ce.hpc.iit.bme.ht	.ce.hpc.iit.bme.hu	AM UTC 9/9/07	AM UTC 9/16/07	BaseCPUTime	second	0.1	4.0		0.4	0.06	0.26
site usage BME IK	ce.npc.iit.bme.nu	.ce.hpc.iit.bme.hu 44371	AM UTC 9/9/07	AM UTC 9/16/07	BaseCPUTIme	e second	0.1	3.0	HUF	0.3	0.06	0.30
site usage	ce.hpc.lit.bme.hu	.ce.hpc.iit.bme.hu	12:00:00 AM UTC 9/9/07	12:00:00 AM UTC 9/16/07	BaseCPUTIme	second	0.1	3.0	HUF	0.3	0.06	0.36
site usage	ce.hpc.lit.bme.hu	.ce.hpc.iit.bme.hu	12:00:00 AM UTC 9/9/07	12:00:00 AM UTC 9/16/07	BaseCPUTIme	second	0.1	4.0	HUF	0.4	0.08	0.48
site usage	ce.hpc.iit.bme.hu	.ce.hpc.iit.bme.hu	12:00:00 AM UTC 9/9/07	12:00:00 AM UTC 9/16/07	BaseCPUTime	second	0.1	6.0	HUF	0.6	0.12	0.72
site usage	ce.hpc.iit.bme.hu	.ce.hpc.iit.bme.hu	12:00:00 AM UTC 9/9/07	12:00:00 AM UTC 9/16/07	BaseCPUTime	e second	0.1	2.0	HUF	0.2	0.04	0.24
site usage	ce.hpc.iit.bme.hu	.ce.hpc.iit.bme.hu	12:00:00 AM UTC 9/9/07	12:00:00 AM UTC 9/16/07	BaseCPUTime	esecond	0.1	2.0	HUF	0.2	0.04	0.24
site usage	ce.hpc.iit.bme.hu	.ce.hpc.iit.bme.hu	12:00:00 AM UTC 9/9/07	12:00:00 AM UTC 9/16/07	BaseCPUTime	second	0.1	2.0	HUF	0.2	0.04	0.24
site usage	ce.hpc.iit.bme.hu	.ce.hpc.iit.bme.hu	12:00:00 AM UTC 9/9/07	12:00:00 AM UTC 9/16/07	BaseCPUTime	esecond	0.1	6.0	HUF	0.6	0.12	0.72
BME IK site usage	ce.hpc.iit.bme.hu	.ce.hpc.iit.bme.hu	12:00:00 AM UTC 9/9/07	12:00:00 AM UTC 9/16/07	BaseCPUTime	e second	0.1	3.0	HUF	0.3	0.06	0.36
BME IK site usage	ce.hpc.iit.bme.hu	.ce.hpc.iit.bme.hu	12:00:00 AM UTC 9/9/07	12:00:00 AM UTC 9/16/07	BaseCPUTime	second	0.1	2.0	HUF	0.2	0.04	0.24
BME IK site usage	ce.hpc.iit.bme.hu	44596 .ce.hpc.iit.bme.hu	12:00:00 AM UTC	12:00:00 AM UTC	BaseCPUTime	esecond	0.1	6.0	HUF	0.6	0.12	0.72
BME IK site usage	ce.hpc.iit.bme.hu	44612 .ce.hpc.iit.bme.hu	12:00:00 AM UTC	12:00:00 AM UTC	BaseCPUTime	second	0.1	4.0	HUF	0.4	0.08	0.48
BME IK site usage	ce.hpc.iit.bme.hu	,44627 .ce.hpc.iit.bme.hu	9/9/07 12:00:00 AM UTC	9/16/07 12:00:00 AM UTC	BaseCPUTime	second	0.1	6.0	HUF	0.6	0.12	0.72
BME IK site usage	ce.hpc.iit.bme.hu	44921 .ce.hpc.iit.bme.hu	9/9/07 12:00:00 AM UTC	9/16/07 12:00:00 AM UTC	BaseCPUTime	esecond	0.1	2.0	HUF	0.2	0.04	0.24
BME IK site usage	ce.hpc.iit.bme.hu	44967 .ce.hpc.iit.bme.hu	9/9/07 12:00:00 AM UTC	9/16/07 12:00:00 AM UTC	BaseCPUTime	second	0.1	2.0	HUF	0.2	0.04	0.24
BME IK site usage	ce.hpc.iit.bme.hu	44995 .ce.hpc.iit.bme.hu	9/9/07 12:00:00 AM UTC	9/16/07 12:00:00 AM UTC	BaseCPUTime	second	0.1	4.0	HUF	0.4	0.08	0.48
BME IK site usage	ce.hpc.iit.bme.hu	45037 .ce.hpc.iit.bme.hu	9/9/07 12:00:00 AM UTC	9/16/07 12:00:00 AM UTC	BaseCPUTime	second	0.1	4.0	HUF	0.4	0.08	0.48
BME IK site usage	ce.hpc.iit.bme.hu	45045 .ce.hpc.iit.bme.hu	9/9/07 12:00:00 AM UTC	9/16/07 12:00:00 AM UTC	BaseCPUTime	second	0.1	0.0	HUF	0.0	0.0	0.0
BME IK site usage	ce.hpc.iit.bme.hu	45055 .ce.hpc.iit.bme.hu	9/9/07 12:00:00 AM UTC	9/16/07 12:00:00 AM UTC	BaseCPUTime	second	0.1	3.0	HUF	0.3	0.06	0.36
BME IK site usage	ce.hpc.iit.bme.hu	45076 .ce.hpc.iit.bme.hu	9/9/07 12:00:00 AM UTC	9/16/07 12:00:00 AM UTC	BaseCPUTime	second	0.1	4.0	HUF	0.4	0.08	0.48
BME IK site usage	ce.hpc.iit.bme.hu	45080 .ce.hpc.iit.bme.hu	9/9/07 12:00:00 AM UTC	9/16/07 12:00:00 AM UTC	BaseCPUTime	second	0.1	3.0	HUF	0.3	0.06	0.36
BME IK site usage	ce.hpc.iit.bme.hu	45097 .ce.hpc.iit.bme.hu	9/9/07 12:00:00	9/16/07 12:00:00	BaseCPUTime	second	0.1	3.0	HUF	0.3	0.06	0.36
5			APTUIC	APIOIC				Sum	HUE	8 500000000000000	4 1 700000000000000000000000000000000000	17 0000000



	Resource	Job	Allocation Start	Allocation End
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	ce.hpc.iit.bme.hu	44284.ce.hpc.iit.bme.hu	9/9/07 1:27:32 AM UTC	9/9/07 1:27:41 AM UTC
	Charge No.	Description	Consumption Price	Is Invoiced
	41618d321514d7b201153d	07f7340080 BME IK site usage	4.0 HUF 41618d3215	14d7b201153d09909700f
	ce.hpc.iit.bme.hu	44303.ce.hpc.iit.bme.hu	9/9/07 3:27:32 AM UTC	9/9/07 3:27:39 AM UTC
	Charge No.	Description	Consumption Price	Is Invoiced
	41618d321514d7b201153d	07f9cf0081 BME IK site usage	3.0 HUF 41618d3215	14d7b201153d09909700f
	ce.hpc.iit.bme.hu	44328.ce.hpc.iit.bme.hu	9/9/07 5:27:32 AM UTC	9/9/07 5:27:41 AM UTC
	Charge No.	Description	Consumption Price	Is Invoiced
	41618d321514d7b201153d	07fc5d0082 BME IK site usage	4.0 HUF 41618d3215	14d7b201153d09909700f4
	ce.hpc.iit.bme.hu	44347.ce.hpc.iit.bme.hu	9/9/07 7:27:32 AM UTC	9/9/07 7:27:40 AM UTC
	Charge No.	Description	Consumption Price	Is Invoiced
	41618d321514d7b201153d	07fef10083 BME IK site usage	3.0 HUF 41618d3215	14d7b201153d09909700f
	ce.hpc.iit.bme.hu	44371.ce.hpc.iit.bme.hu	9/9/07 9:27:32 AM UTC	9/9/07 9:27:40 AM UTC
	Charge No.	Description	Consumption Price	Is Invoiced
	41618d321514d7b201153d	0801670084 BME IK site usage	3.0 HUF 41618d3215	14d7b201153d09909700f
	ce.hpc.iit.bme.hu	44394.ce.hpc.iit.bme.hu	9/9/07 11:27:32 AM UTC	2 9/9/07 11:27:41 AM UT
	Charge No.	Description	Consumption Price	Is Invoiced
	41618d321514d7b201153d	0804110085 BME IK site usage	4.0 HUF 41618d3215	14d7b201153d09909700f
	ce.hpc.iit.bme.hu	44416.ce.hpc.iit.bme.hu	9/9/07 1:27:32 PM UTC	9/9/07 1:27:42 PM UTC
	Charge No.	Description	Consumption Price	Is Invoiced
	41618d321514d7b201153d	0806ad0086 BME IK site usage	6.0 HUF 41618d3215	14d7b201153d09909700f
	ce.hpc.iit.bme.hu	44440.ce.hpc.iit.bme.hu	9/9/07 3:27:33 PM UTC	9/9/07 3:27:39 PM UTC
	Charge No.	Description	Consumption Price	Is Invoiced
	41618d321514d7b201153d	080a500087 BME IK site usage	2.0 HUF 41618d3215	14d7b201153d09909700f
	ce.hpc.iit.bme.hu	44478.ce.hpc.iit.bme.hu	9/9/07 5:27:32 PM UTC	9/9/07 5:27:38 PM UTC
	Charge No.	Description	Consumption Price	Is Invoiced
	41618d321514d7b201153d	080cd90088 BME IK site usage	2.0 HUF 41618d3215	14d7b201153d09909700f
	ce.hpc.iit.bme.hu	44499.ce.hpc.iit.bme.hu	9/9/07 7:27:32 PM UTC	9/9/07 7:27:38 PM UTC
	Charge No.	Description	Consumption Price	Is Invoiced
	41618d321514d7b201153d	080f720089 BME IK site	2.0 HUF 41618d3215	14d7b201153d09909700f

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