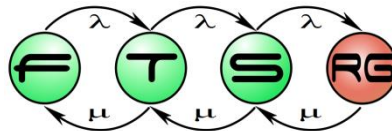


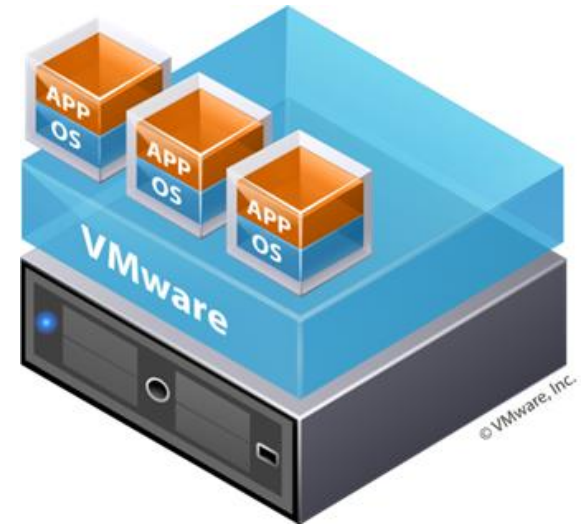
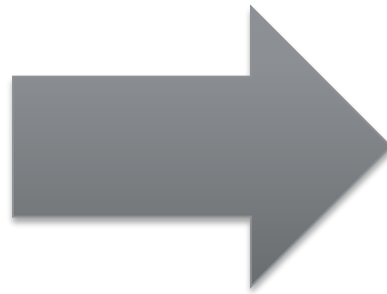
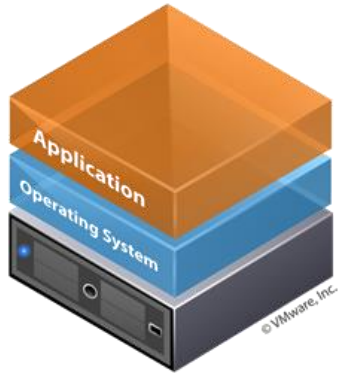
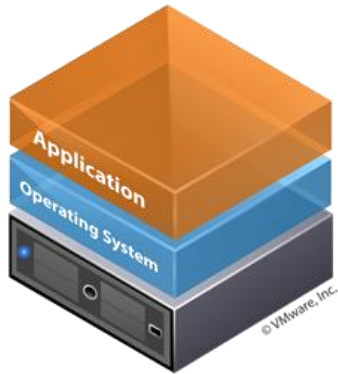
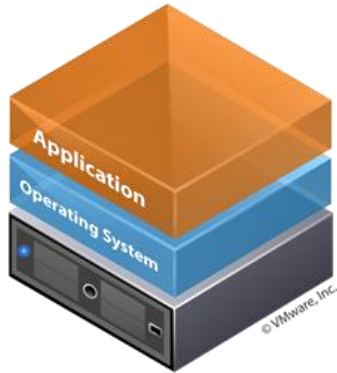
## Virtualizált környezetek teljesítménymérése és elemzése

Micskei Zoltán, Nádudvari György fóliáinak felhasználásával

**Budapest University of Technology and Economics**  
**Fault Tolerant Systems Research Group**



# Tradicionális és virtualizált környezet

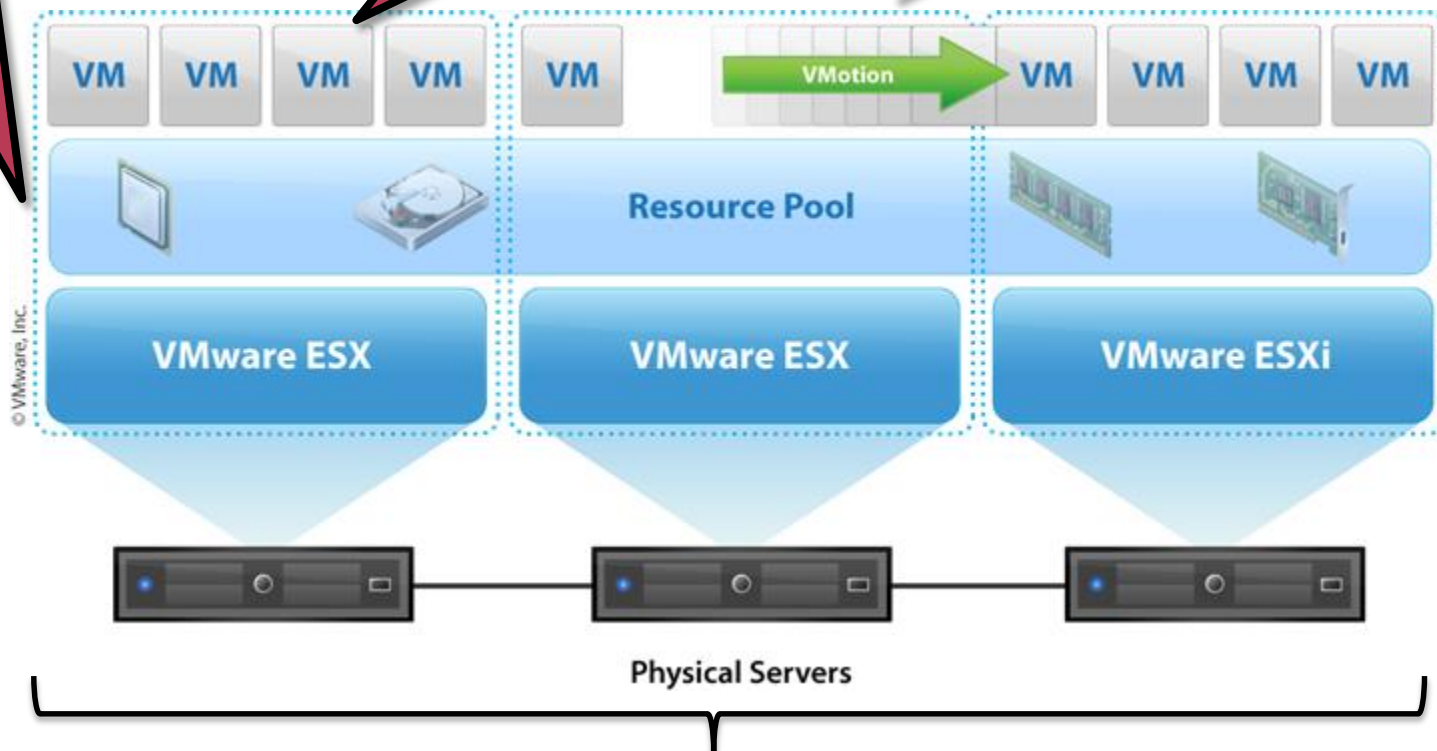


# További funkciók virtualizáció esetén

Közös erőforrás-  
készletek

Korlátok  
megadása

Virtuális gépek (VM)  
átmozgatása futás  
közben (live migration)



Fürt (Cluster) – hibatűrés, terhelés elosztása...

Megjegyzés: Az elnevezések VMware-specifikusak, de hasonló funkciók elérhetőek más termékekben is.

# Teljesítménymérés problémái

Többi VM „zavar”, közös HW erőforrásokon osztoznak

Alkalmazás teljesítménye érdekelne



Még egy plusz absztrakciós réteg (hypervisor)

VM-en belüli OS (vendég OS) mérései pontatlanok



© VMware, Inc.

# Teljesítménymérés VMware platformon

- VM és hypervisor szinten is
- Erőforrások:
  - Processzorok (cpu.\*)
  - Memória (mem.\*)
  - Lemez (disk.\*)
  - Hálózat (net.\*)
- Erőforrásokhoz 20-30 darab  
(performance counter)



# Teljesítményszámlálók

- Alapesetben mérési periódus
- Számított érték (átlag, összeg...)

`cpu.usage.average` [%]

A CPU idő mekkora részét használta átlagosan az elmúlt mérési periódusban

`cpu.wait.summation` [ms]

Mennyi időt töltött összesen várakozással az elmúlt mérési periódusban

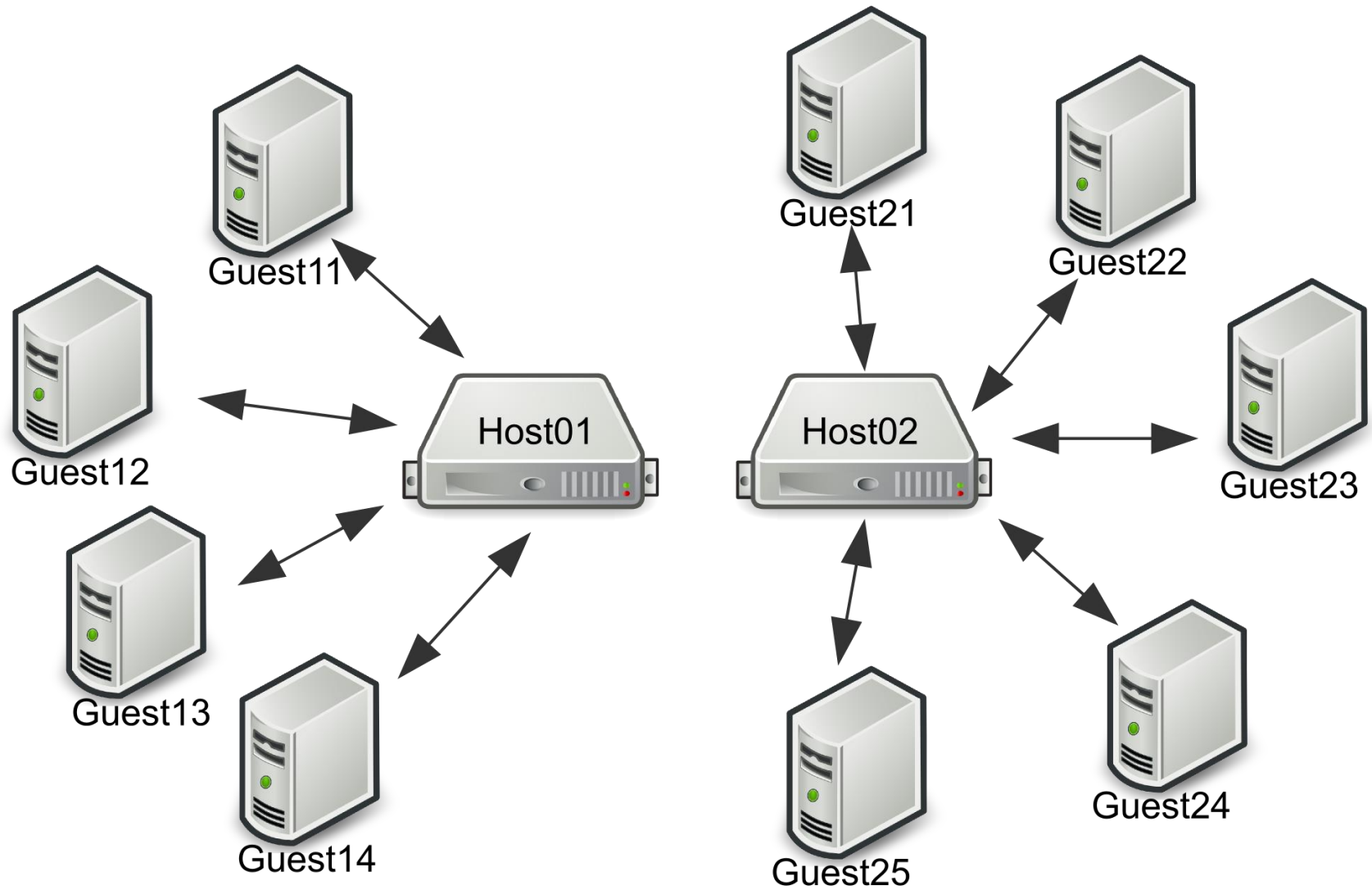
# Környezet

- A következő rendszert mértük 1 hónapig:
  - 2 fizikai gép (1 CPU 4 mag, 18 GB RAM, 2 db Gbit adapter, iSCSI hálózati tárhely)
  - 10 db VM (vegyesen Linux és Windows)
- 94 (fizikai) + 50 (VM) számláló rögzítése
- 20 sec felbontás

**$\Sigma$  290 MB-nyi CSV fájl**

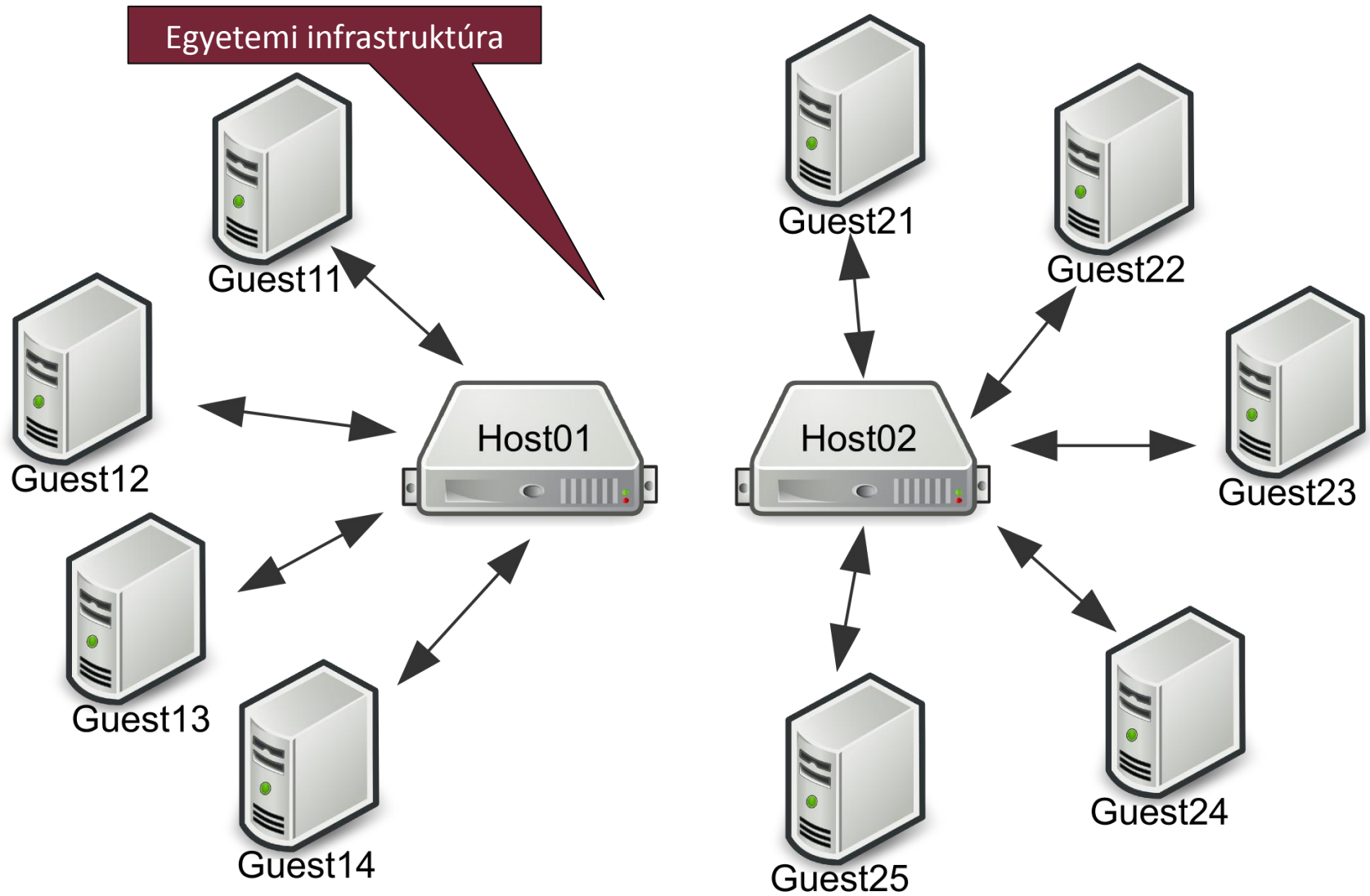
**$\Sigma$  89 millió mérési pont**

# Példa

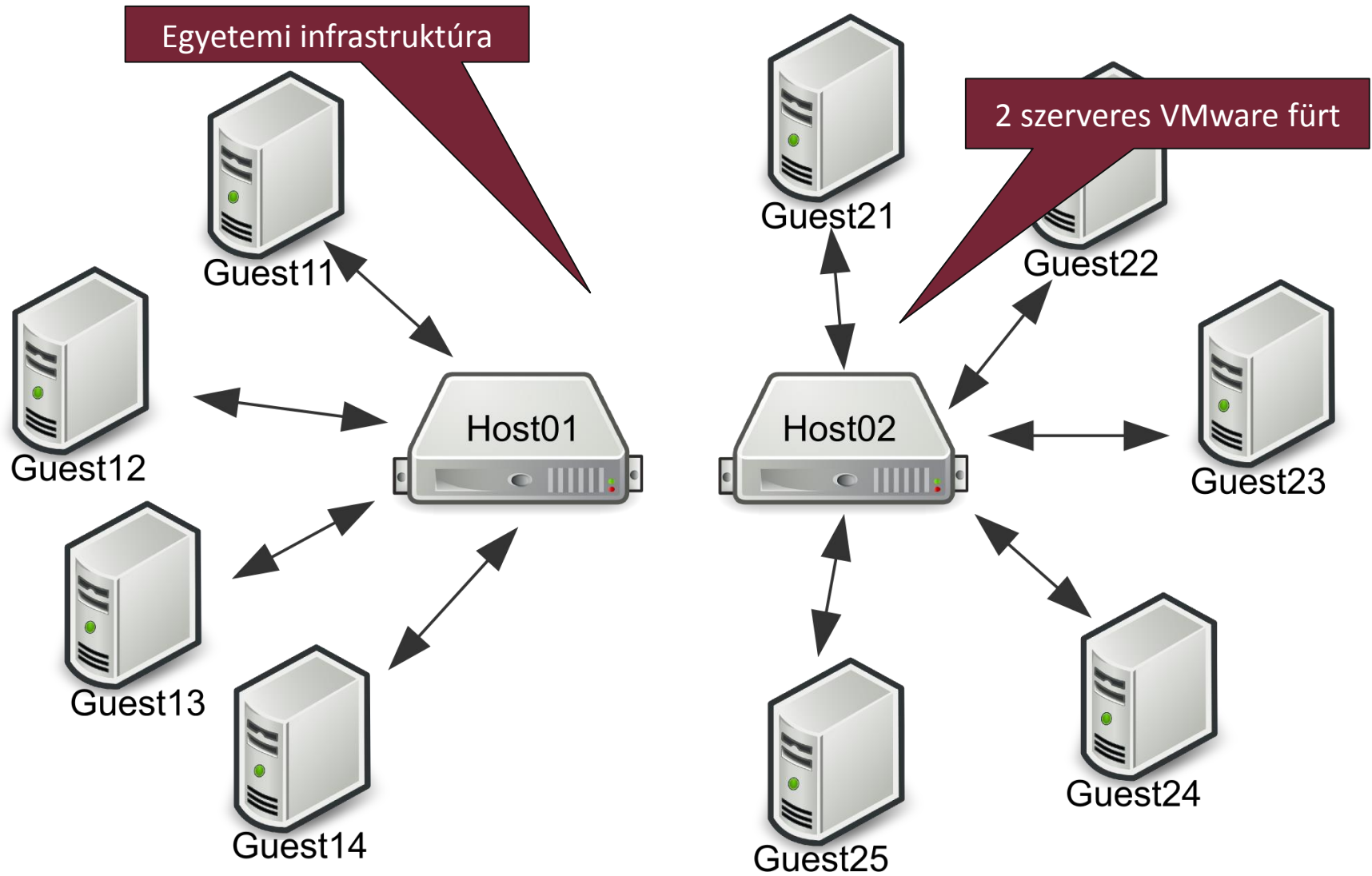




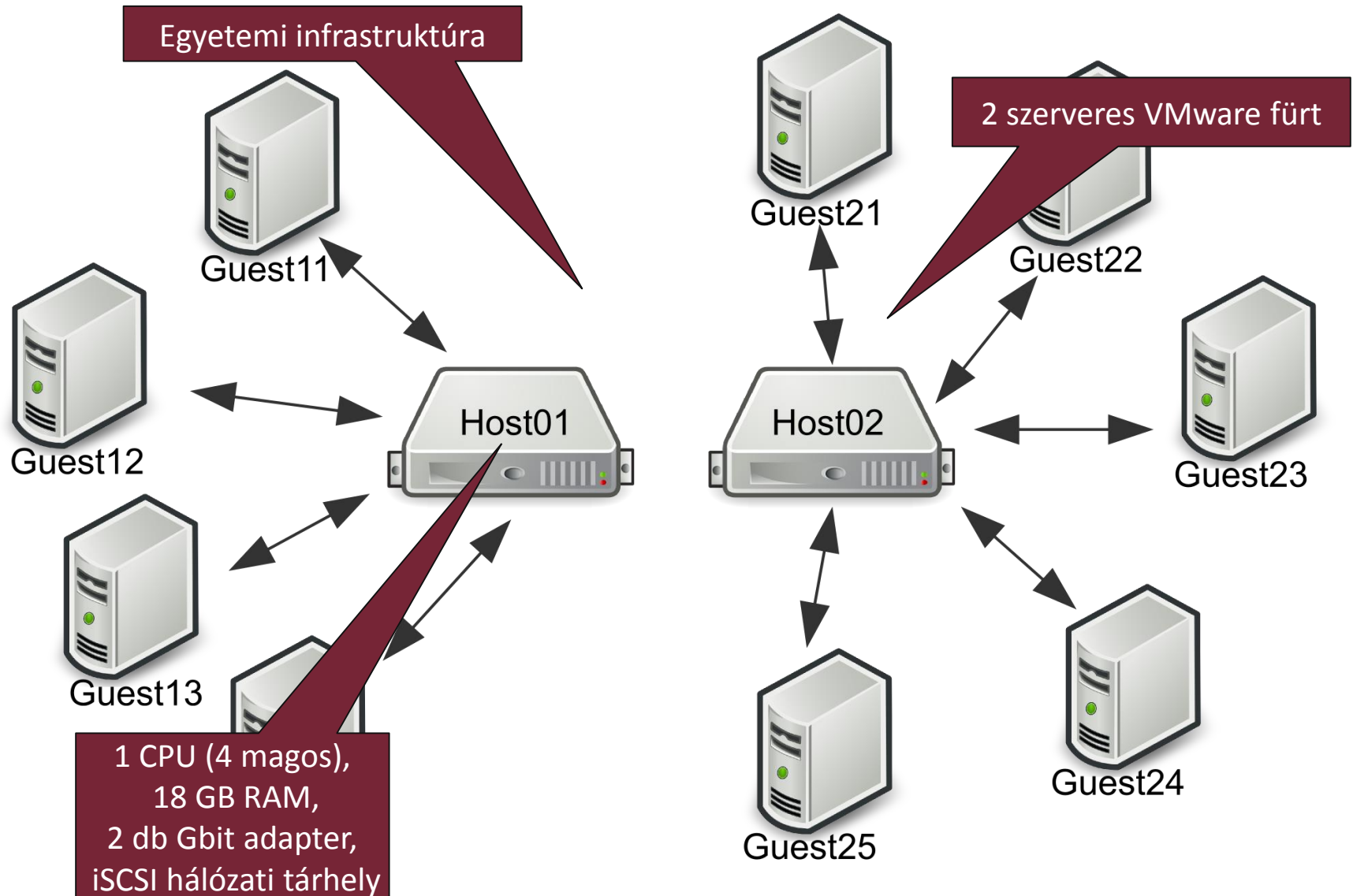
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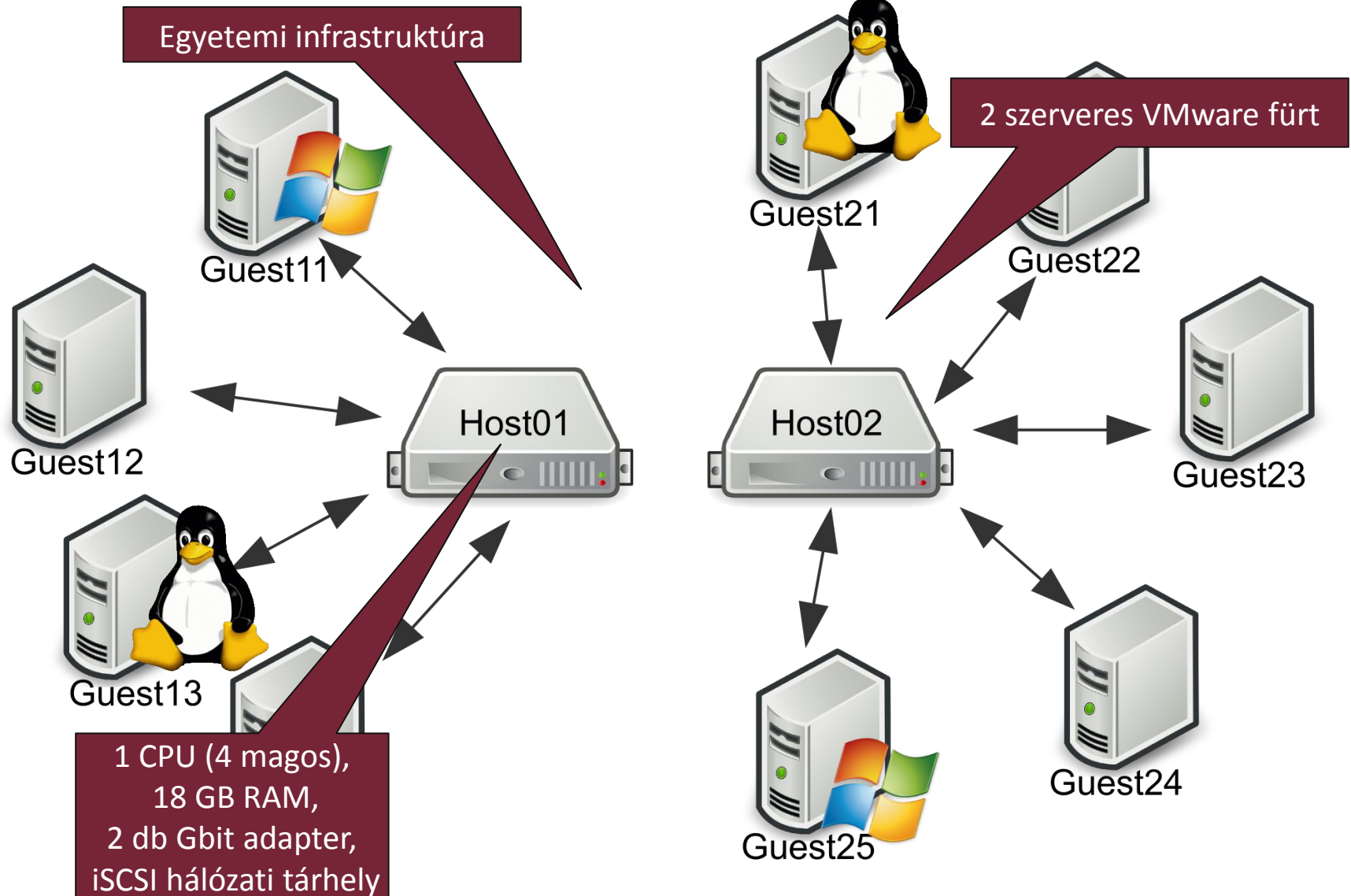
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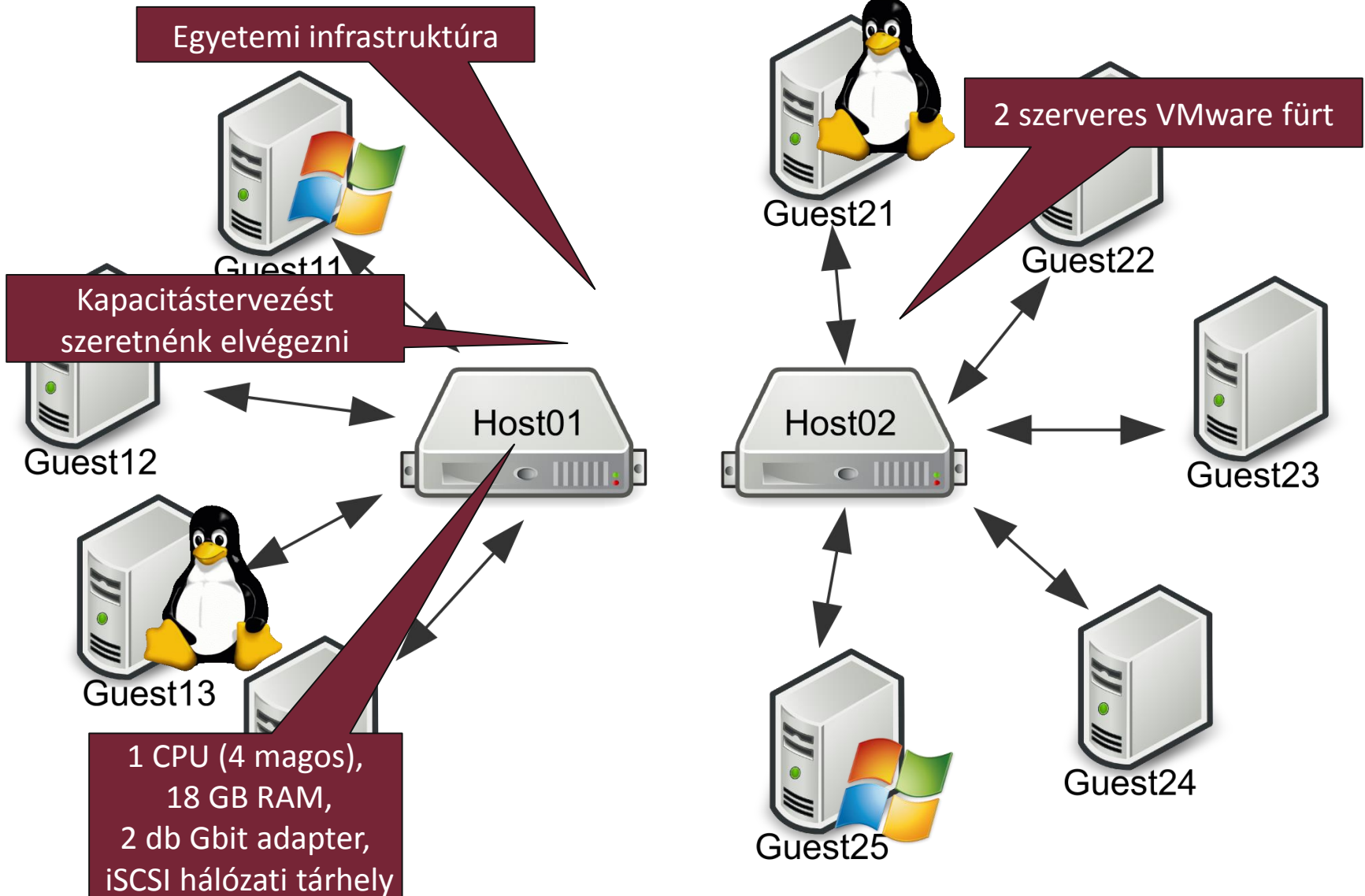
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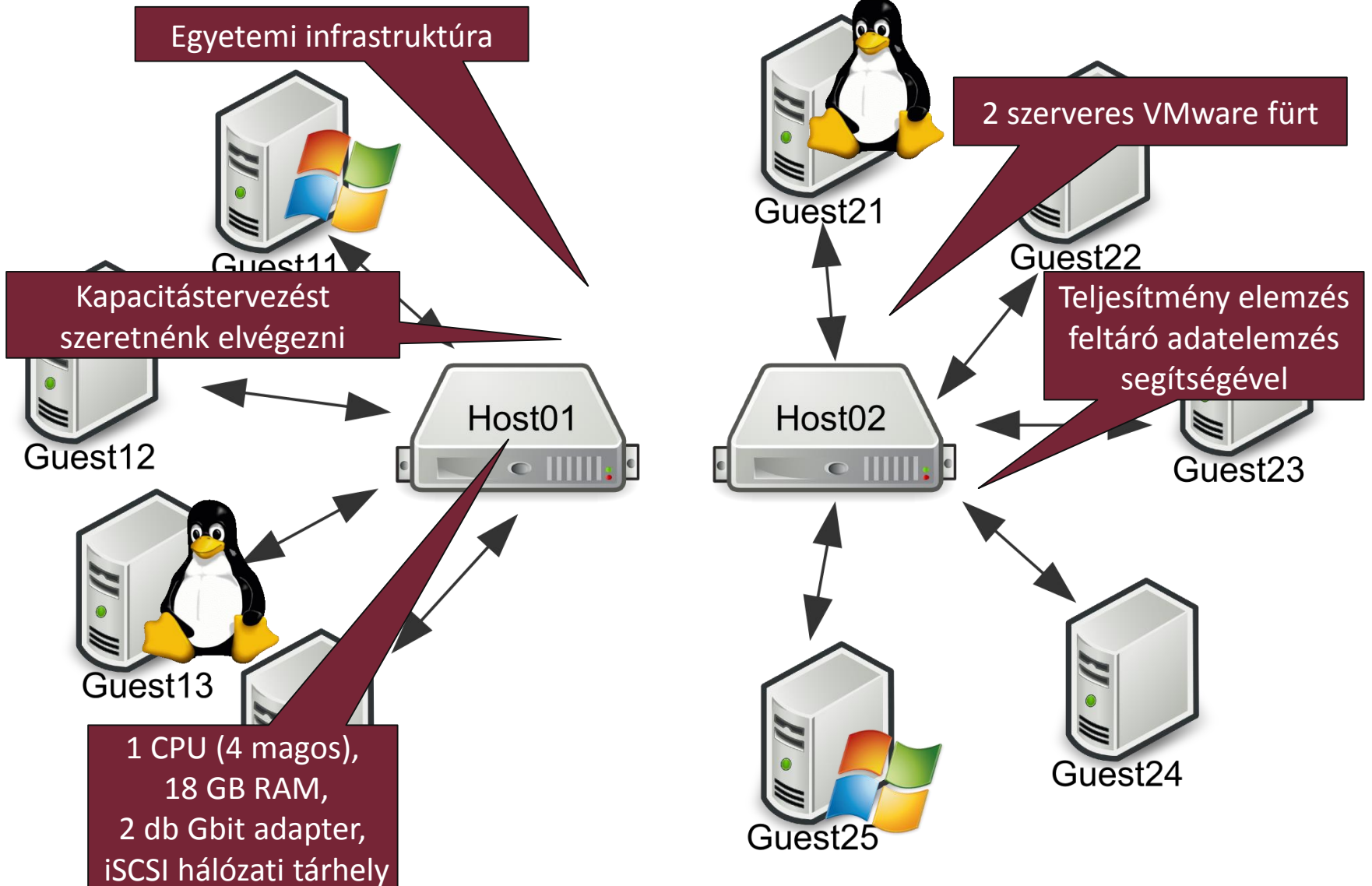
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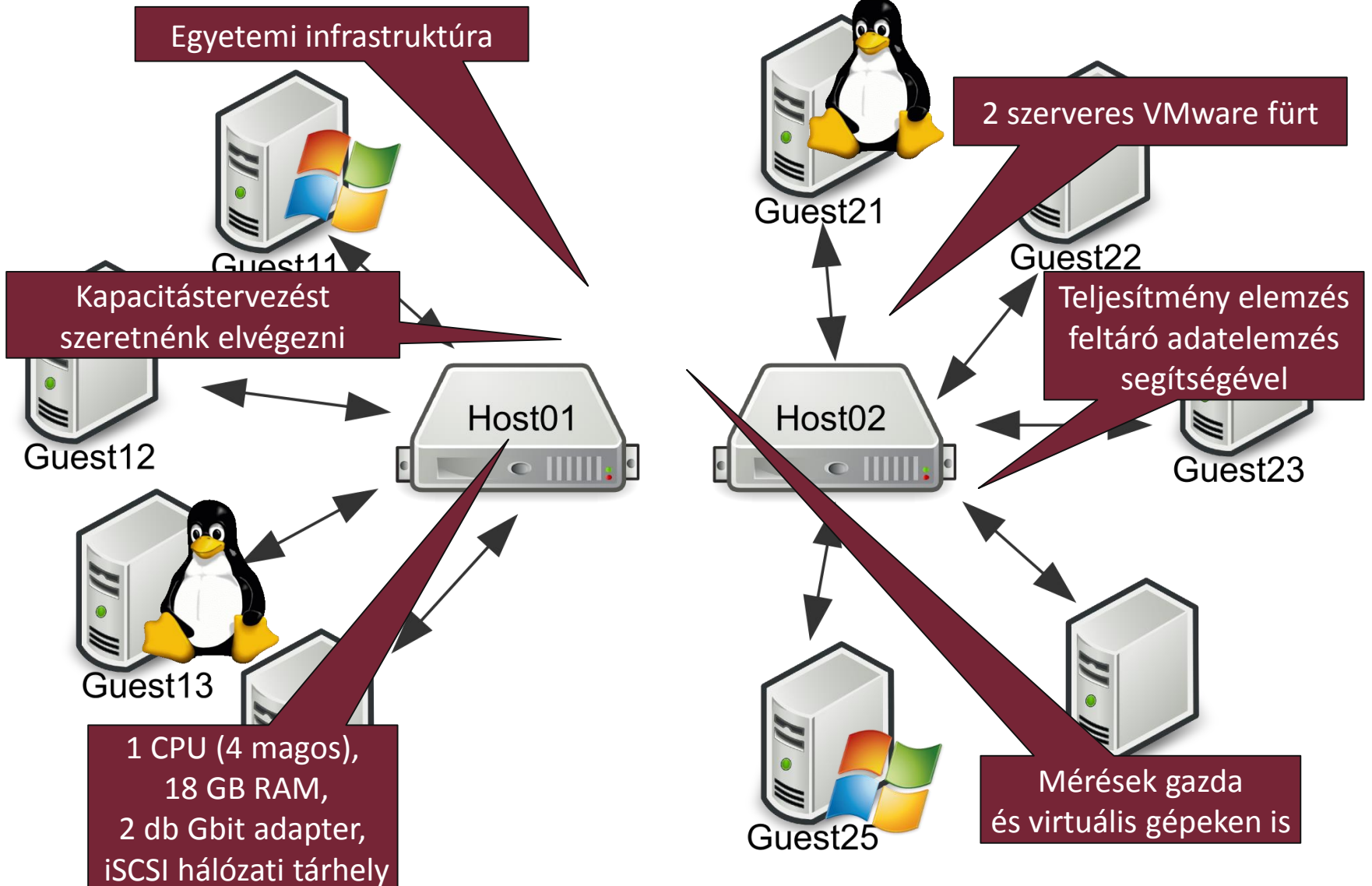
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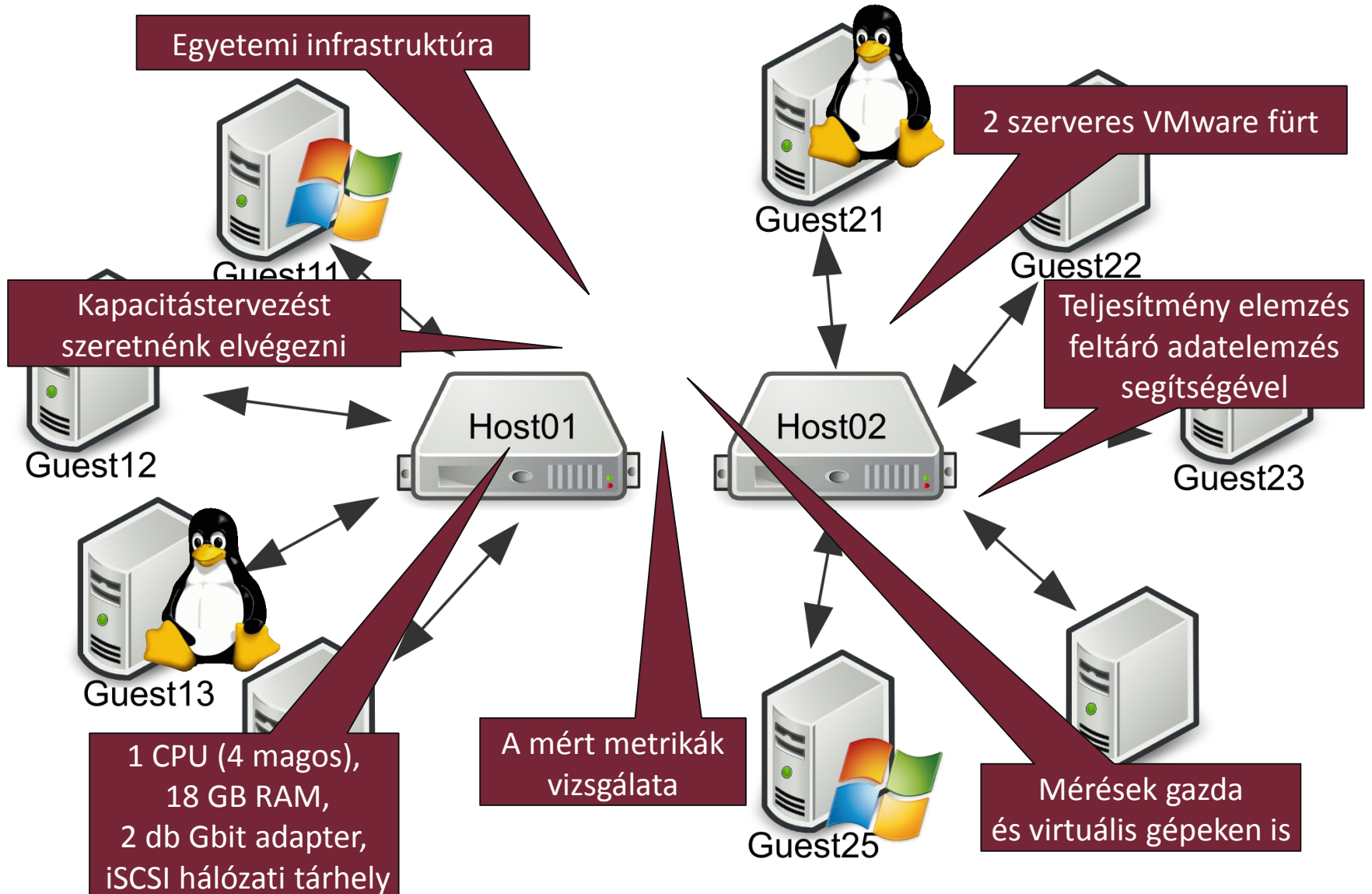
# Példa



# Példa

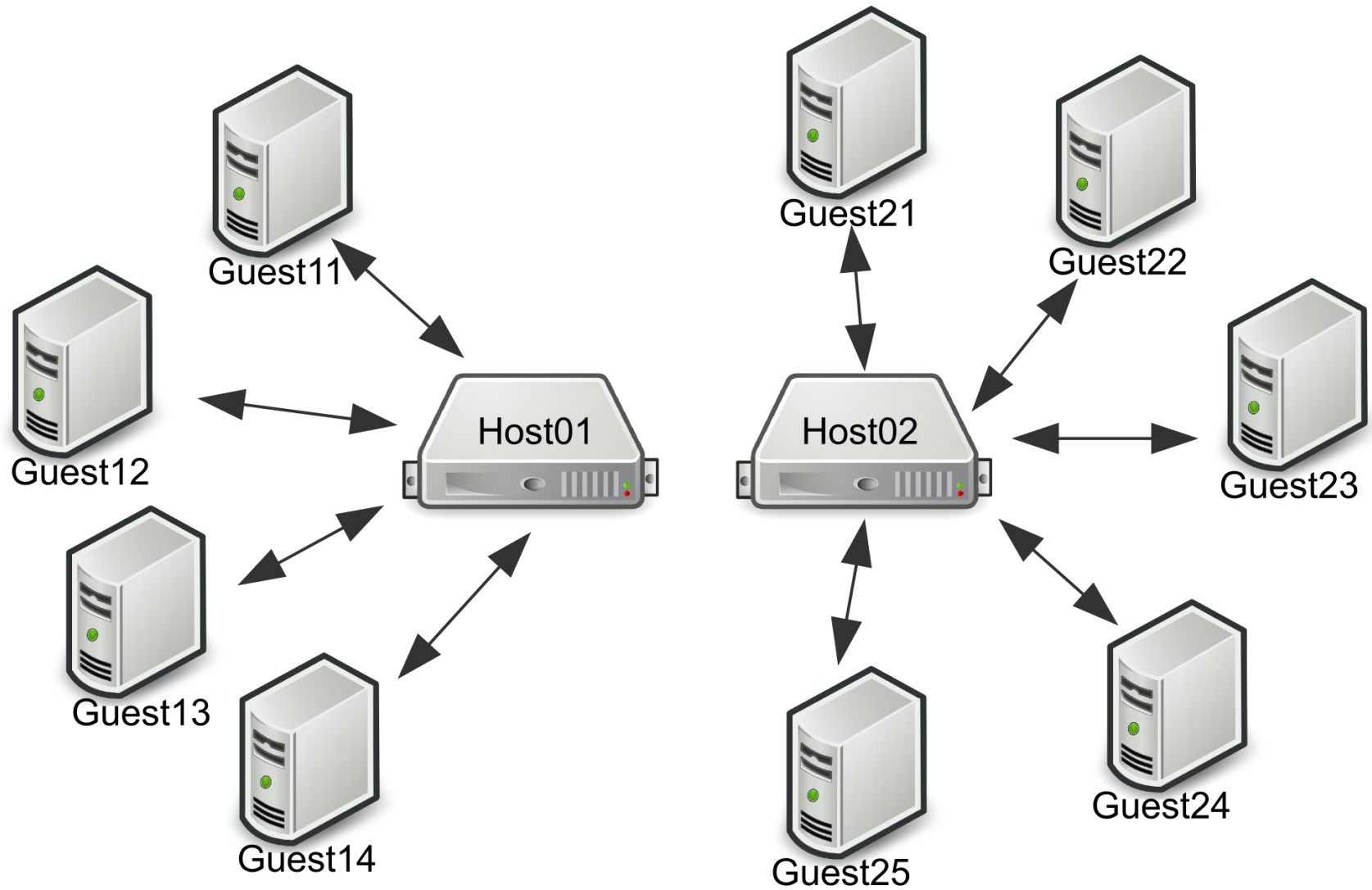


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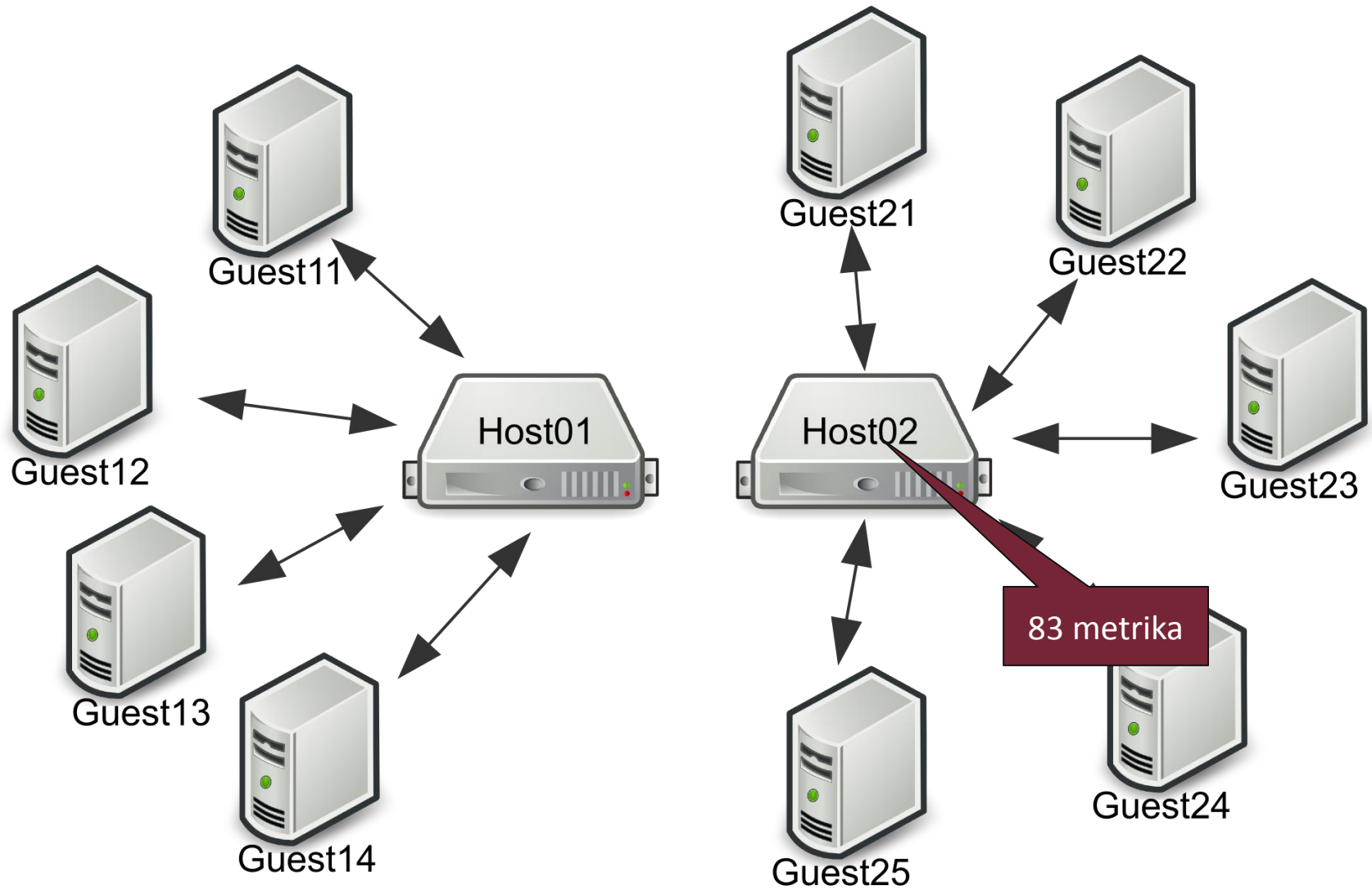




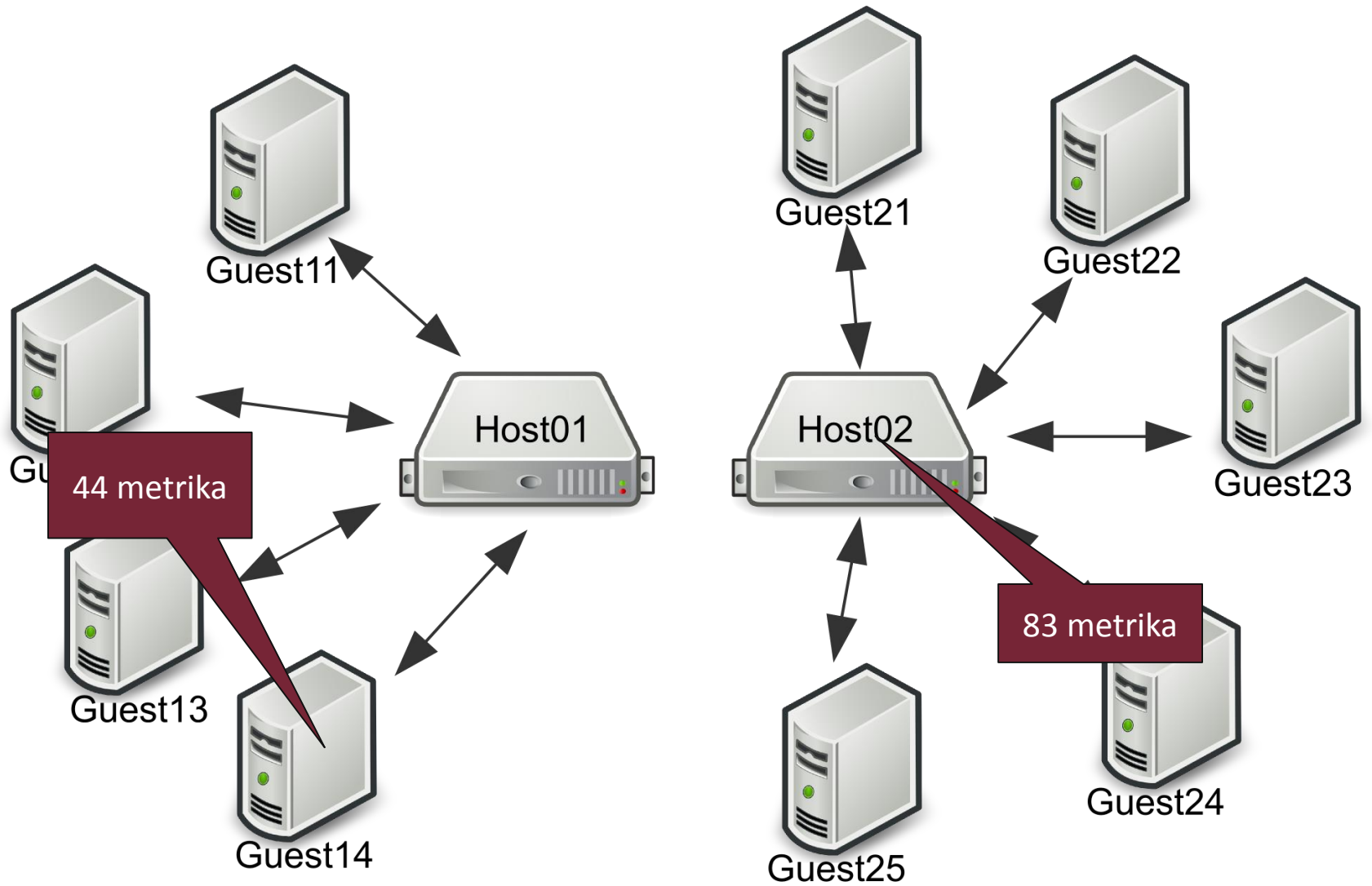
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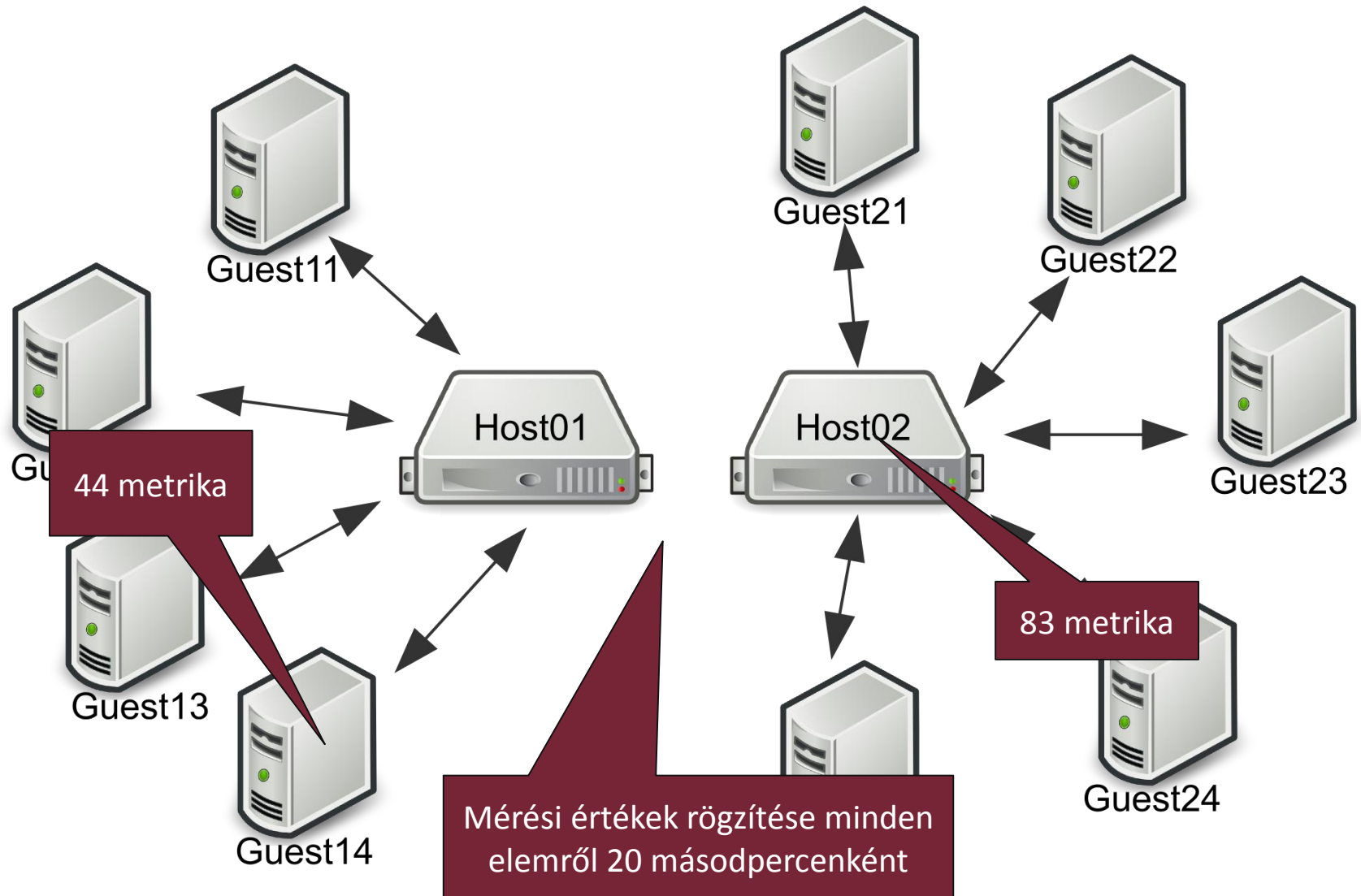
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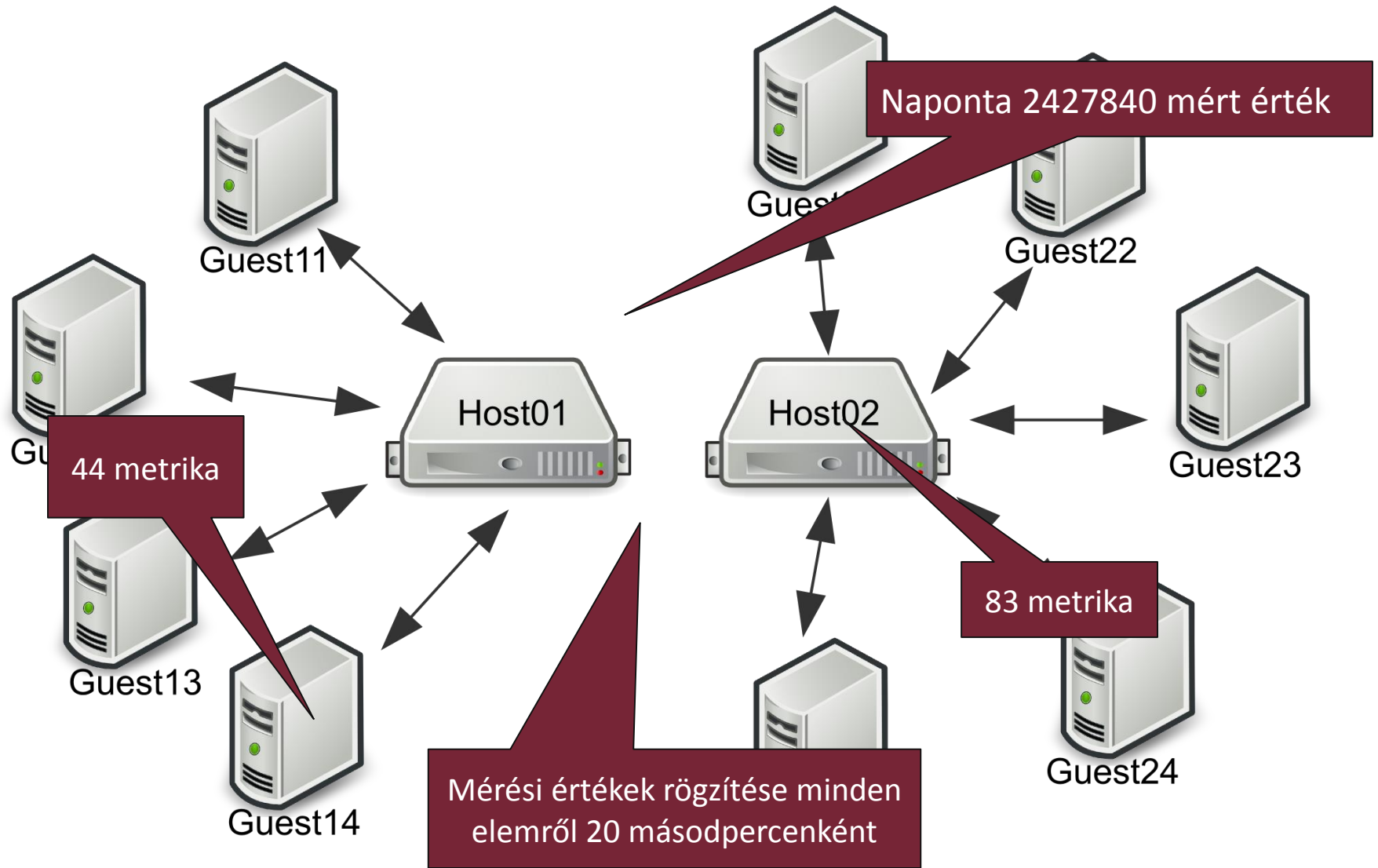
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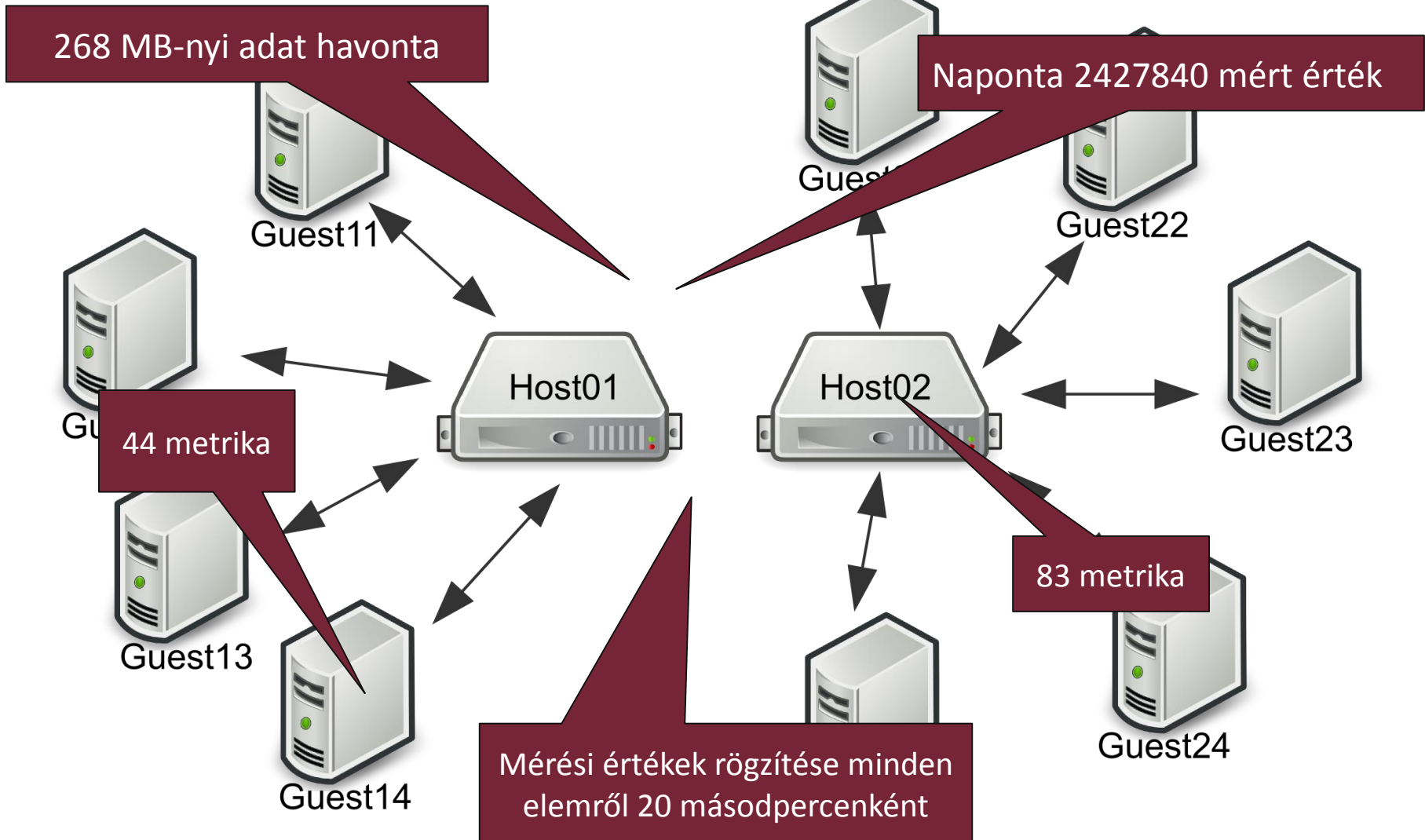
# Példa



# Példa



# Példa



# Példa

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09/22/20	18877	18877	28	28	1075	1075	0	0	22	224.85	97	94	940	940	18896	18896	188740	0	2095068	2097152	32872	2100	0	0	
09/22/20	19119	19119	33	33	828	828	0	0	22	223.81	76	73	738	738	19139	19139	188740	0	2095068	2097152	32872	2100	0	0	
09/22/20	19192	19192	40	40	750	750	0	0	19	193.43	68	65	659	659	19212	19212	146800	0	2095068	2097152	33016	2100	0	0	
09/22/20	19227	19227	34	34	719	719	0	0	20	203.29	65	62	629	629	19246	19246	146800	0	2095068	2097152	33016	2100	0	0	
09/22/20	19229	19229	29	29	721	721	0	0	22	223.31	66	63	638	638	19249	19249	146800	0	2095068	2097152	33016	2100	0	0	
09/22/20	19232	19232	33	33	715	715	0	0	18	183.27	65	62	628	628	19251	19251	125828	0	2095068	2097152	32920	2100	0	0	
09/22/20	19056	19056	25	25	901	901	0	0	28	284.16	83	80	805	805	19075	19075	125828	0	2095068	2097152	32920	2100	0	0	
09/22/20	19257	19257	17	17	706	706	0	0	17	173.19	63	61	618	618	19276	19276	146800	0	2095068	2097152	33032	2100	0	0	
09/22/20	19219	19219	36	36	726	726	0	0	21	213.33	66	63	636	636	19240	19240	167772	0	2095068	2097152	33000	2100	0	0	
09/22/20	19193	19193	31	31	756	756	0	0	18	183.49	69	66	669	669	19212	19212	167772	0	2095068	2097152	33000	2100	0	0	
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09/22/20	19238	19238	38	38	704	704	0	0	19	193.24	64	62	620	620	19257	19257	167772	0	2095068	2097152	32904	2100	0	0	
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09/22/20	19111	19111	30	30	842	842	0	0	20	203.9	78	75	757	757	19131	19131	188740	0	2095068	2097152	32888	2100	0	0	
09/22/20	19253	19253	25	25	701	701	0	0	18	183.22	64	61	615	615	19273	19273	188740	0	2095068	2097152	32888	2100	0	0	
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# Példa

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09/22/20	19229	19229	29	29	721	721	0	0	22	223.31	66	63	638	638	19249	19249	146800	0	2095068	2097152	33016	2100	0	0	
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09/22/20	19249	19249	25	25	706	706	0	0	19	193.22	64	61	618	618	19269	19269	209712	0	2095068	2097152	32872	2100	0	0	
09/22/20	19251	19251	34	34	697	697	0	0	19	193.21	64	61	614	614	19271	19271	230684	0	2095068	2097152	32888	2100	0	0	
09/22/20	19273	19273	26	26	680	680	0	0	17	173.1	62	59	598	598	19291	19291	230684	0	2095068	2097152	32888	2100	0	0	
09/22/20	19289	19289	26	26	686	686	0	0	20	203.16	63	60	604	604	19290	19290	230684	0	2095068	2097152	32888	2100	0	0	
09/22/20	19280	19280	23	23	697	697	0	0	18	183.19	63	61	610	610	19279	19279	272628	0	2095068	2097152	32920	2100	0	0	
09/22/20	19266	19266	30	30	685	685	0	0	19	193.12	62	59	600	600	19286	19286	272628	0	2095068	2097152	32920	2100	0	0	
09/22/20	19255	19255	23	23	701	701	0	0	19	193.2	64	61	613	613	19275	19275	272628	0	2095068	2097152	32920	2100	0	0	
09/22/20	19267	19267	21	21	692	692	0	0	17	173.17	63	60	605	605	19285	19285	188740	0	2095068	2097152	32888	2100	0	0	
09/22/20	19111	19111	30	30	842	842	0	0	20	203.9	78	75	757	757	19131	19131	188740	0	2095068	2097152	32888	2100	0	0	
09/22/20	19253	19253	25	25	701	701	0	0	18	183.22	64	61	615	615	19273	19273	188740	0	2095068	2097152	32888	2100	0	0	
09/22/20	19237	19237	34	34	710	710	0	0	21	213.27	65	62	628	628	19257	19257	272628	0	2095068	2097152	32856	2100	0	0	
09/22/20	19354	19354	23	23	602	602	0	0	19	192.73	54	52	521	521	19374	19374	272628	0	2095068	2097152	32856	2100	0	0	
09/22/20	19280	19280	23	23	679	679	0	0	19	193.11	62	59	598	598	19299	19299	272628	0	2095068	2097152	32856	2100	0	0	
09/22/20	19250	19250	36	36	694	694	0	0	18	183.19	63	60	608	608	19270	19270	188740	0	2095068	2097152	32952	2100	0	0	
09/22/20	18875	18875	25	25	1081	1081	0	0	22	224.8	96	93	938	938	18894	18894	188740	0	2095068	2097152	32952	2100	0	0	
09/22/20	19096	19096	29	29	855	855	0	0	22	223.94	78	76	760	760	19115	19115	188740	0	2095068	2097152	32952	2100	0	0	
09/22/20	19232	19232	24	24	723	723	0	0	21	213.33	66	63	639	639	19252	19252	209712	0	2095068	2097152	33032	2100	0	0	
09/22/20	19267	19267	27	27	689	689	0	0	19	193.13	62	60	602	602	19287	19287	209712	0	2095068	2097152	33032	2100	0	0	
09/22/20	19208	19208	23	23	747	747	0	0	18	183.44	68	66	662	662	19227	19227	209712	0	2095068	2097152	33032	2100	0	0	
09/22/20	19252	19252	33	33	697	697	0	0	21	213.21	64	61	614	614	19272	19272	167772	0	2095068	2097152	32936	2100	0	0	
09/22/20	19026	19026	30	30	923	923	0	0	22	224.33	86	84	843	843	19045	19045	230684	0	2095068	2097152	32936	2100	0	0	
09/22/20	19257	19257	27	27	697	697	0	0	20	203.19	63	61	610	610	19276	19276	251656	0	2095068	2097152	32936	2100	0	0	
09/22/20	19265	19265	24	24	693	693	0	0	19	193.19	63	61	611	611	19285	19285	335544	0	2095068	2097152	32904	2100	0	0	
09/22/20	19204	19204	31	31	746	746	0	0	22	223.47	69	66	668	668	19223	19223	335544	0	2095068	2097152	32904	2100	0	0	
09/22/20	19233	19233	24	24	722	722	0	0	23	233.3	66	63	634	634	19252	19252	335544	0	2095068	2097152	32904	2100	0	0	
09/22/20	19265	19265	24	24	690	690	0	0	19	193.3	66	63	631	631	19285	19285	272628	0	2095068	2097152	32872	2100	0	0	
09/22/20	19092	19092	27	27	864	864	0	0	23	233.95	79	76	765	765	19111	19111	272628	0	2095068	2097152	32984	2100	0	0	
09/22/20	19277	19277	22	22	684	684	0	0	18	183.12	62	59	598	598	19296	19296	272628	0	2095068	2097152	32984	2100	0	0	
09/22/20	19134	19134	23	23	821	821	0	0	20	203.79	75	73	731	731	19153	19153	230684	0	2095068	2097152	32888	2100	0	0	
09/22/20	18860	18860	38	38	1084	1084	0	0	24	244.84	96	94	944	944	18880	18880	230684	0	2095068	2097152	33000	2100	0	0	
09/22/20	19265	19265	28	28	686	686	0	0	18	183.14	62	60	600	600	19285	19285	230684	0	2095068	2097152	33000	2100	0	0	
09/22/20	19262	19262	25	25	693	693	0	0	18	183.17	63	60	607	607	19281	19281	314572	0	2095068	2097152	32968	2100	0	0	
09/22/20	19268	19268	28	28	685	685	0	0	19	193.13	62	60	601	601	19288	19288	314572	0	2095068	2					

















# KITEKINTÉS: KAPACITÁS/KÖLTSÉGSZÁMÍTÁS OKTATÁSI FELHŐHÖZ



# Hogyan becsüljük költséget? (DEMÓ)

