



INTESA SANPAOLO
GROUP SERVICES

SAN Monitoring using Zabbix

A perfect dress for a powerful engine

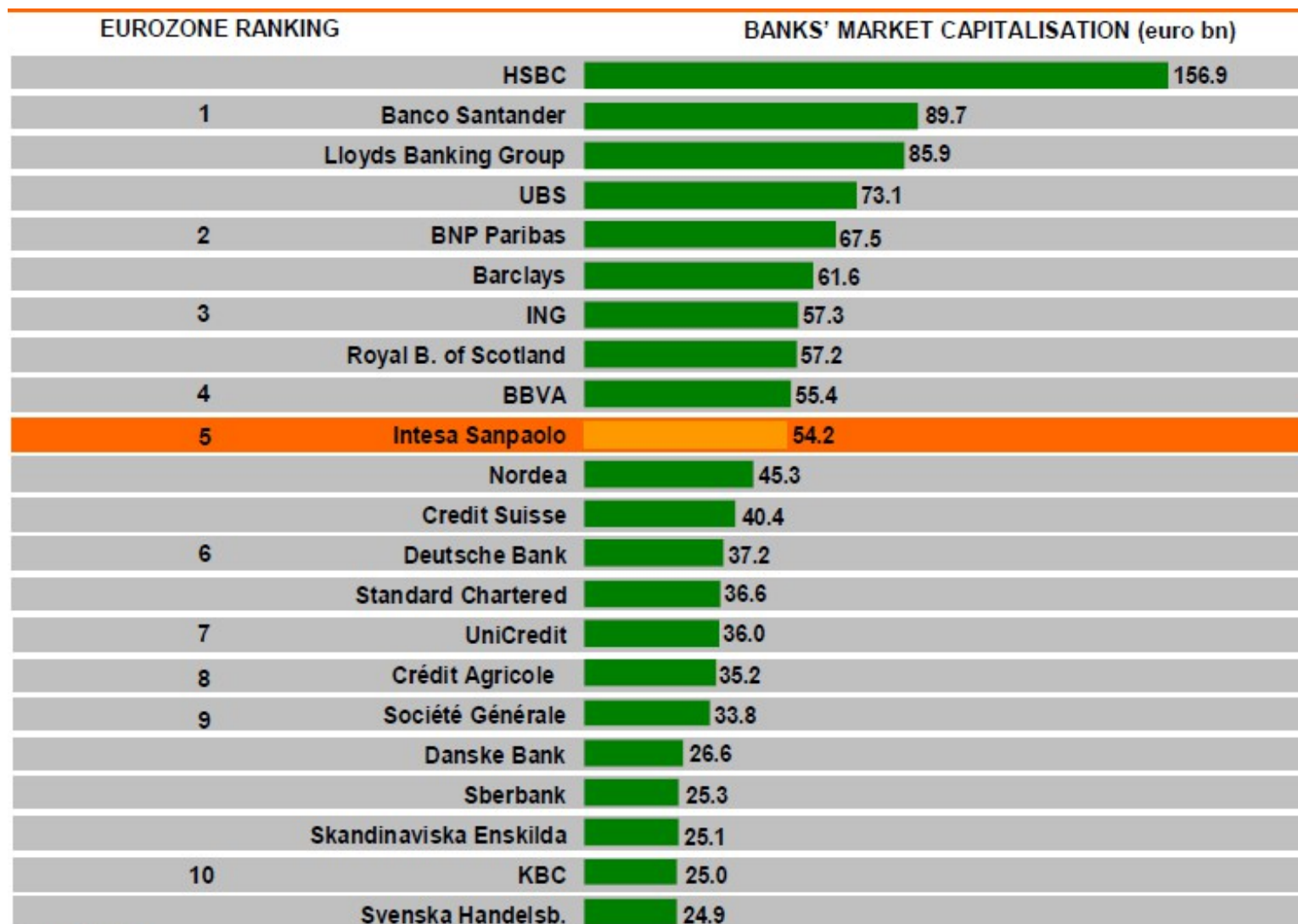
IntesaSanpaolo bank: Italian Leader with a European Scale

- **Largest domestic network: approximately 4,400 branches and 11.1 million clients**
- **Strategic international presence**
 - Selected commercial banking presence in Central and Eastern Europe and Middle Eastern and North African countries reaching **8.3 million clients in 12 countries through a network of approximately 1,400 branches**



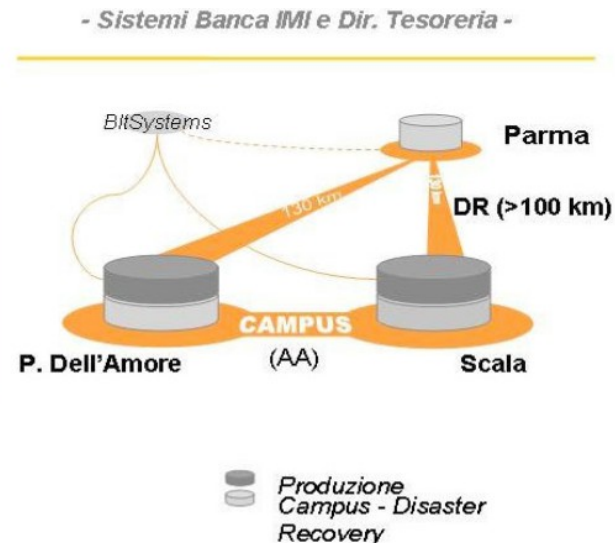
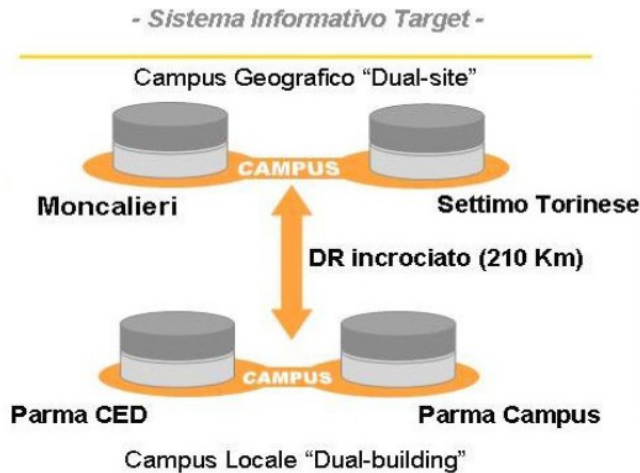
Market Capitalisation⁽²⁾
euro 54.2 bn

IntesaSanpaolo bank: European Scale



ISGS : ICT service for IntesaSanpaolo

- **90 mln of transactions per day** supported by our ICT infrastructure.
- **4 Datacenters** to allow high reliability of data in case of disaster.
- **Availability of 2 sites in each of the 3 production centers** (Torino, Milano and Parma) in synchronous copy mode.
- **Disaster recovery assured by a third site availability** for each site in asynchronous copy mode.



IntesaSanpaolo Datacenters

Datacenters distribution and replication paths



The Storage Area Network (SAN)

- **A Storage Area Network (SAN) is a high speed network that connect Storage devices.**

In our SAN Mainframe *45 Storage devices* (IBM's System Storage DS8000 and IBM Tape libraries) are connected with *6 IBM mainframe z/systems* via *28 Brocade DCX 8510-8 Backbone Ficon director*.

- **Ficon directors are the heart of SAN.**

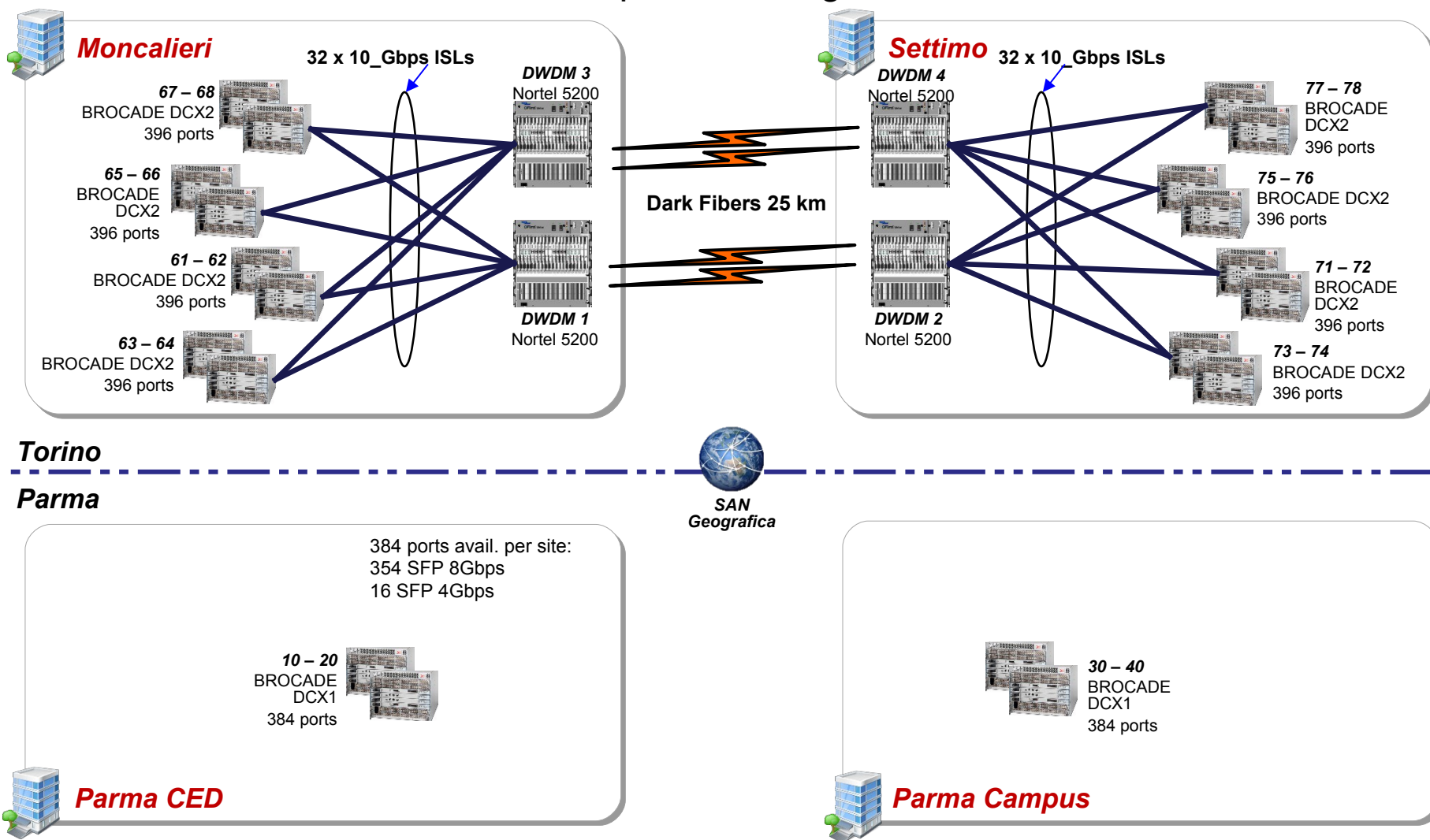
Ficon directors are fibre channel switches with more than 128 ports that connect an high number of storage devices forming a SAN.

- **Monitoring Ficon Director means receive health status information from all storage devices of the SAN and the quality of data throughput.** Indeed all data traffic passes through it's ports.



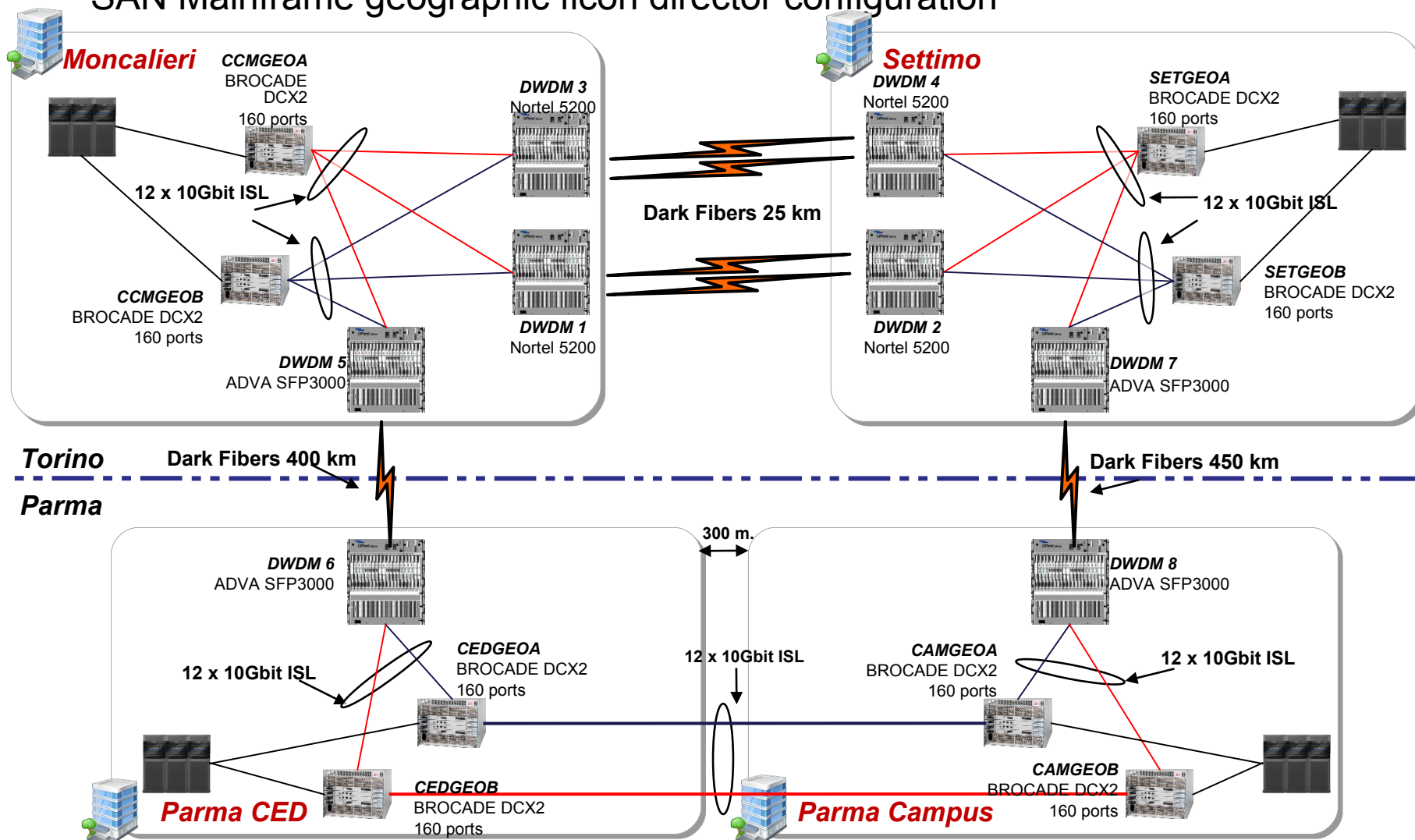
SAN Mainframe: metropolitan data replication

Mainframe Ficon director Metropolitan configuration



SAN Mainframe: Geographic data replication

SAN Mainframe geographic ficon director configuration



SAN Mainframe summary

- **28 Brocade DCX 8510-8 Backbone Ficon director with 9728 ports**
- Every Ficon director's ports are divided in **three virtual partitions named Contexts** (Base, Ficon and PPRC contexts)
- **32 ISL link at 10 Gbps speed** to connect Moncalieri to Settimo Torinese
- **24 DS8000 IBM Storage devices** (3589 Tb) e **21 IBM TS3500 and TS77x0 Tape Library devices** (19742 Tb)

**Ficon director is the core of SAN.
Monitoring them allows to control all the network.**

What's to be monitored? From past to present.

Alerts from the z/OS

Tracing IOS error messages from mainframe z/OS. This didn't allow to know the type of failure and its position.

Alerts directly from the Ficon director

This allows to know where is the failure and to solve the problem faster.

Monitor of the 57% of SAN

Before we monitored only the 16 metropolitan ficon director. We noticed problems involving only the ficon contexts.

Monitor all the SAN

To extend control to all the contexts including geographic replication (PPRC) and disaster recovery devices.

Why Zabbix?

- **Many ways to monitor the SAN**

Possibility to collect data using both SNMP protocol, Zabbix trapper and network simple checks.

- **Automatic build and update of monitored objects**

Using Zabbix low level discovery powerful features we have to set initial template rules to find all the ports and let the SAN to form itself.

- **Easily manage great volumes of objects**

In our SAN we have a large amount of items per host and **390 NVPS**:

1774 items x 72 hosts = 127728 items to be monitored !!!

- **Tailored front end for NOC and Storage and Data Management**

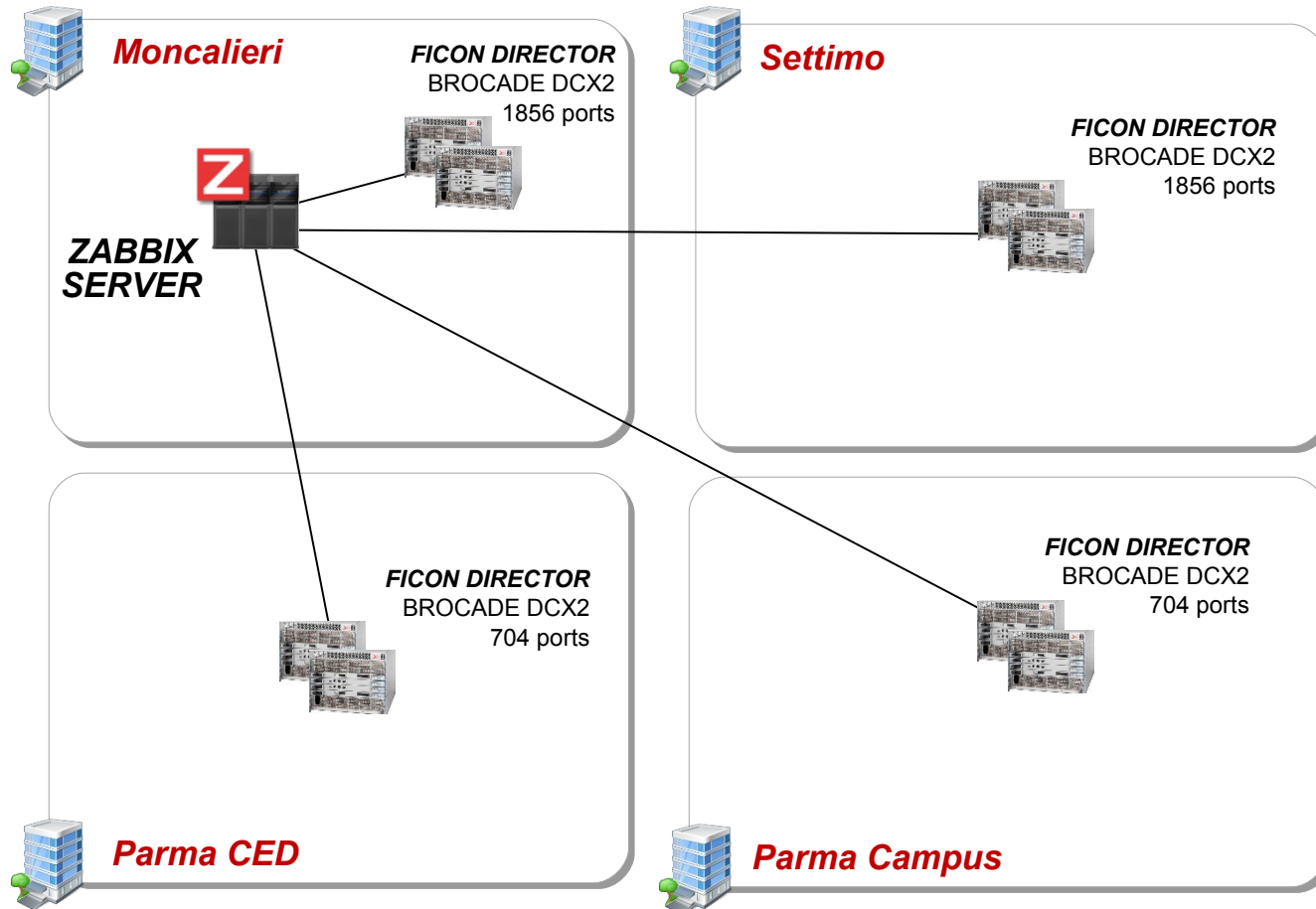
With Zabbix API we can develop a tailored front end fitting different needs to monitor, manage and analyze problems of SAN.

- **Zabbix knowledge and support on site**

Working side by side with Zabbix expert and front end developers it's fundamental to reach our targets.

How Zabbix works in IntesaSanpaolo?

- **Zabbix connects to all ficon directors through SNMP protocol.**
Same of the network checks are made using other protocols (e.g. SSH).



How we structured Zabbix: Hosts and templates

- **2 Templates to manage context with different severity levels**
In our SAN the base context is the most critical because its ISL ports manage all the traffic that passes from a datacenter to another.
- **4 host groups: One for each data center**
We have created four host groups to fastly recognize the location of device in trouble and save time in technical resolution of the problem.
- **72 hosts: every host represent a switch context**
This hosts organization has been designed to reflect that each context transmits distinct kind of data with different severity.
- **27 Items per port and 14 items per switch context**
These are divided in 6 applications that represent different types of item:
 - 2 apps for switch and port technical details and attached device
 - 2 apps for traffic quality (Rx / Tx and port errors)
 - 2 apps for port healthy status and switch hardware controls

A customized front end with Zabbix API

WHY?

- **Improve data presentation**
We needed better performance and data organization. Zabbix maps and Latest data panel were inadequate for our targets.
- **High interactive data analysis**
Zabbix graphs couldn't offer anything else than time range selection and static information.
- **Custom extra features for NOC**
We needed an advanced system to track problem management.

HOW?

- **Modern and flexible web technologies utilization**
Using javascript framework like EXTJS we built leaner interfaces with custom layouts.
- **Custom powerful graphs**
Using HIGHCHARTS advanced features we take advantage of items compare, zoom and customized graphical mode.
- **DB for events management**
Issues are recorded as they happen, and purged as they are solved.

SAN Mainframe monitor: targets and organization

Monitor

- Near real time alert dashboard
- Switch groups map
- Custom triggers to avoid false alarms

Manage

- Issues management system for NOC
- Ignored issues filtering system
- Administration panel

Analyze

- Switch context overview panel
- Port details panel
- Port traffic and errors charts

SAN Mainframe monitor: the alert dashboard panel

Cruscotto Sistema Storico ISL Gestione Admin ZABBIX OK 16:23:39

PROBLEMI ATTIVI (2 problemi) Problemi attivi

Criticità ↓	Inizio ↓	Durata	Switch	Porta	Descrizione	Ack ↑	
Media	29/07/15 11:07:34	1g 5h 14m	DCX68_Ficon	2/20-94	Porta Ficon Offline	Si	☐
Media	20/07/15 11:48:36	10g 4h 33m	DCX73_Ficon	3/29-ad	Porta Ficon Offline	Si	☐

Alert dashboard

MONCALIERI

CCMGEOA	CCMGEOA_Base	CCMGEOB
CCMGEOB_Base	DCX61_Base	DCX61_Ficon
DCX61_PPRC	DCX62_Base	DCX62_Ficon
DCX62_PPRC	DCX63_Base	DCX63_Ficon
DCX63_PPRC	DCX64_Base	DCX64_Ficon
DCX64_PPRC	DCX65_Base	DCX65_Ficon
DCX65_PPRC	DCX66_Base	DCX66_Ficon
DCX66_PPRC	DCX67_Base	DCX67_Ficon
DCX67_PPRC	DCX68_Base	DCX68_Ficon
DCX68_PPRC		

SETTIMO

DCX71_Base	DCX71_Ficon	DCX71_PPRC
DCX72_Base	DCX72_Ficon	DCX72_PPRC
DCX73_Base	DCX73_Ficon	DCX73_PPRC
DCX74_Base	DCX74_Ficon	DCX74_PPRC
DCX75_Base	DCX75_Ficon	DCX75_PPRC
DCX76_Base	DCX76_Ficon	DCX76_PPRC
DCX77_Base	DCX77_Ficon	DCX77_PPRC
DCX78_Base	DCX78_Ficon	DCX78_PPRC
SETGEOA	SETGEOA_Base	SETGEOB
SETGEOB_Base		

PR CED

CEDGEOA
CEDGEOA_Base
CEDGEOB
CEDGEOB_Base
DCX10_Base
DCX10_Ficon
DCX20_Base
DCX20_Ficon

PR CAMPUS

CAMGEOA
CAMGEOA_Base
CAMGEOB
CAMGEOB_Base
DCX30_Base
DCX30_Ficon
DCX40_Base
DCX40_Ficon

Context host groups

SAN Mainframe Monitor : the management panel

Cruscotto Sistema Storico ISL **Gestione** Admin ZABBIX OK 11:30:19

TUTTI I PROBLEMI (31 problemi) Tutti Raggruppa OFF

Criticità ↓	Inizio ↓	Switch	Porta	Descrizione	Attivo ↓	Ack ↑	
Media	23/07/15 09:52:35	DCX68_Ficon	2/20-94	Porta Ficon Offline	Si	Si	
Media	22/07/15 15:55:34	DCX68_Ficon	2/20-94	Porta Ficon Offline	Si	Si	
Media	19/07/15 13:56:02	DCX68_Ficon	2/20-94	Porta Ficon Offline	Si	Si	
Media	22/07/15 15:58:11	DCX68_Ficon	2/20-94	Errori nella codifica dei dati sulla porta	No	Si	
Media	22/07/15 15:58:11	DCX68_Ficon	2/20-94	Errori nella trasmissione dei dati sulla porta	No	Si	
Media	22/07/15 14:29:28	DCX68_Ficon	2/20-94	Errori nella trasmissione dei dati sulla porta	No	Si	
Media	22/07/15 11:29:48	DCX66_PPRC	2/24-98	Porta PPRC Offline	No	Si	
Media	22/07/15 03:46:09	DCX61_PPRC	2/24-98	Porta PPRC Offline	No	Si	
Media	22/07/15 03:46:05	DCX62_Ficon	3/12-2c	Porta Ficon Offline	No	Si	
Media	22/07/15 03:45:59	CCMGEOA	2/7-17	Porta GEO Offline	No	Si	
Media	22/07/15 03:45:52	CCMGEOA	1/7-7	Porta GEO Offline	No	Si	
Media	20/07/15 11:48:36	DCX73_Ficon			No	Si	
Media	19/07/15 13:48:18	DCX68_Ficon			No	Si	
Media	19/07/15 13:15:20	DCX68_Ficon			No	Si	
Media	19/07/15 13:03:18	DCX68_Ficon			No	Si	
Media	18/07/15 15:06:18	DCX68_Ficon			No	Si	
Media	18/07/15 00:31:33	DCX73_Ficon			No	Si	
Media	17/07/15 11:13:25	DCX61_Ficon			No	Si	
Media	17/07/15 09:22:30	DCX73_Ficon			No	Si	
Media	17/07/15 09:10:30	DCX73_Ficon			No	Si	
Media	17/07/15 08:55:30	DCX73_Ficon			No	Si	
Media	17/07/15 08:07:30	DCX73_Ficon			No	Si	
Media	16/07/15 06:22:30	DCX73_Ficon			No	Si	
Media	16/07/15 01:25:30	DCX73_Ficon			No	Si	
Media	13/07/15 09:51:45	DCX62_Ficon			No	Si	
Media	08/07/15 16:08:48	DCX66_PPRC	2/24-98	Porta PPRC Offline	No	Si	
Media	08/07/15 14:41:48	DCX66_PPRC	2/24-98	Porta PPRC Offline	No	Si	

ACKNOWLEDGE [DCX68_Ficon] TrgPort-PortCrcsError-[2/20-94]

Inizio problema 19/07/15 13:15:20

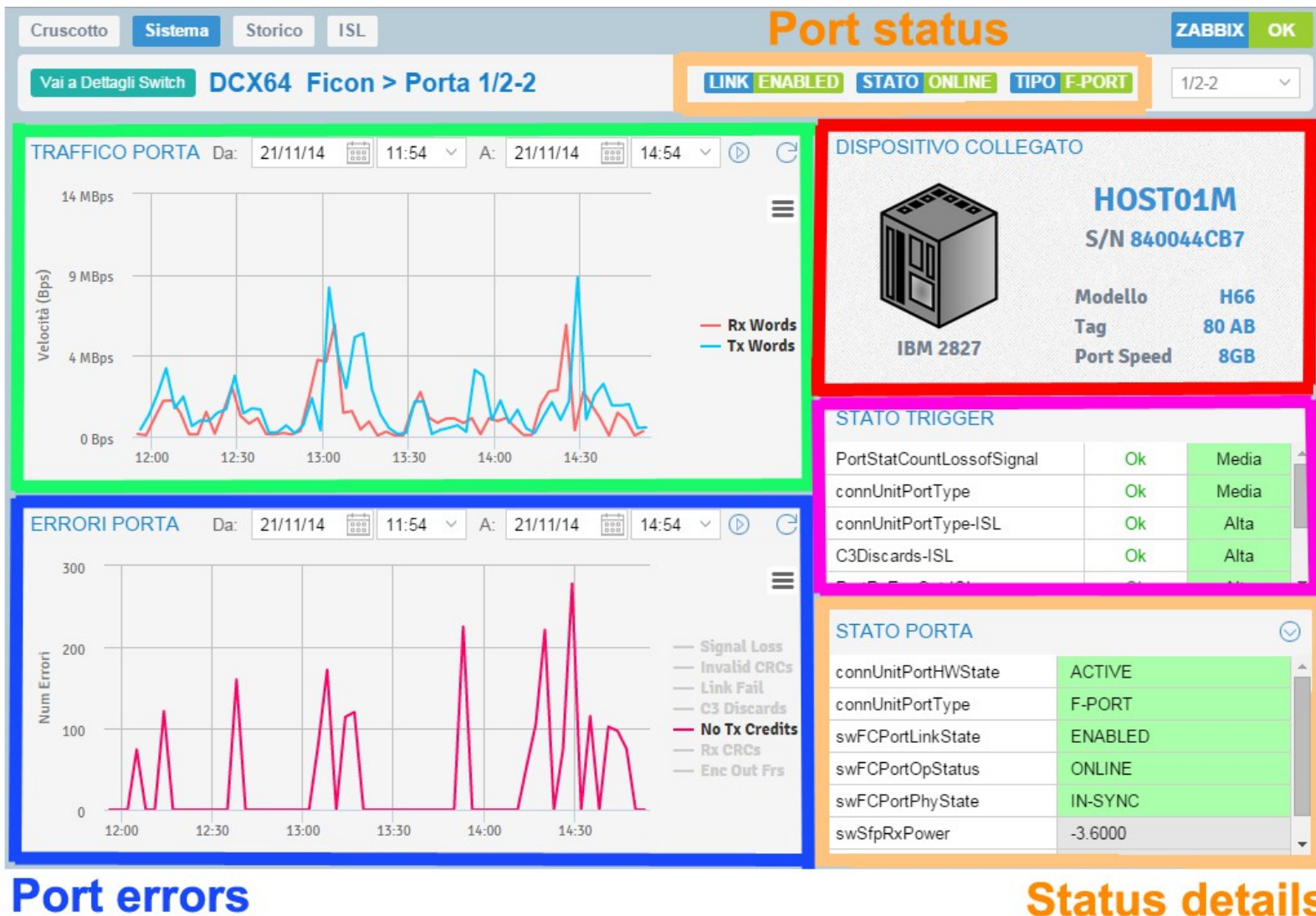
Data ↓	Utente	Messaggio
23/07/15 00:39:47	Stefano Andrioli (u028457)	Segnalato a Zuliani che sta facendo verifiche con i tecnici IBM e cablatori
20/07/15 08:15:10	Orazio Raciti (U028466)	la chiamata associata alla problematica porta 20/94 e 74A1SZcFH

Event management

Issues list

SAN Mainframe Monitor : the port details panel

Port traffic



Future purposes

- **IBM DS8000, TS3500 and TS77x0 monitoring**
- **Z/os Mainframe data configuration integration**
- **Service based items aggregations for SLA measurement**

Thank you for your attention